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Milk and Malt

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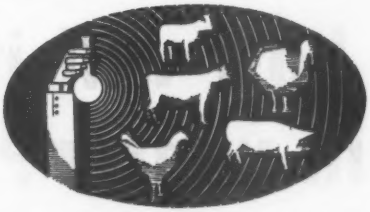

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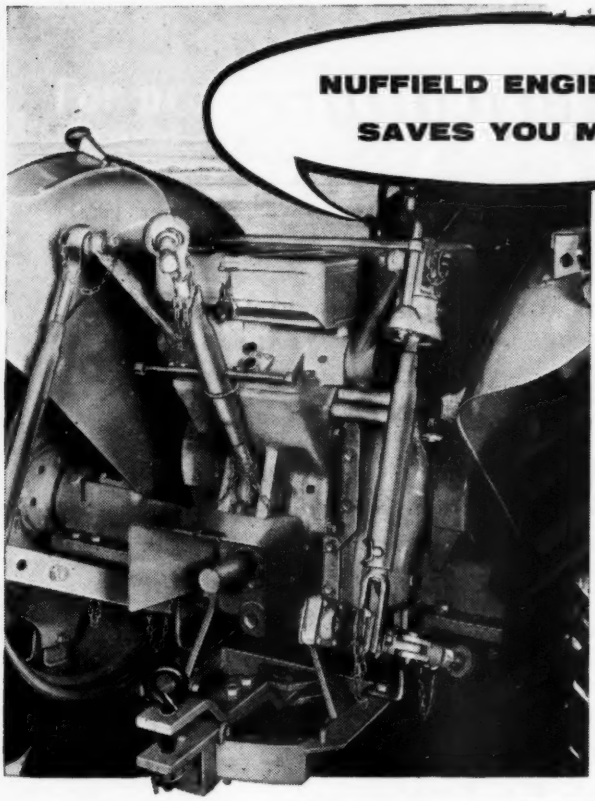

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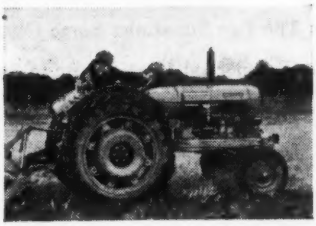

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The Pedigree Flock

P. G. JAMES, M.A., DIP.AG.SCI.(CANTAB.)
School of Agriculture, Cambridge University

Faced with falling prices for commercial fat lambs, a flock-master may be tempted into the higher-priced ram lamb market. How would this affect his farming system and his sheep income? Mr. James considers the financial results of the pedigree flock, and presents the physical requirements of the system.

THE end product in a pedigree flock is not the fat or store lamb, but the pedigree ram or ewe lamb sold for breeding. This calls for a specialized system of sheep production, requiring a very high degree of skill and unlimited enthusiasm by the flock-master, if the highest results are to be achieved. Costs are naturally high, but the market places a premium on good quality stock, and the returns to successful management can be very attractive.

The ewes (and ewe lambs) are normally tupped in early August, to lamb in early January. This ensures that the ram lambs are ready for the pedigree sales in September, at eight months of age. From 100 breeding ewes, it is reasonable to expect 130 lambs, of which one-half will be ram lambs. Not all of these, however, can be sold as such. Those that are dropped late in the season, and any twins or triplets (perhaps 20 out of 65), are normally cut and sold as wethers. The remainder, together with the ewe lambs, are sold in September for breeding. The average flock life is five years, and losses average five per cent per year.

Size of flock

A pedigree flock requires full-time skilled shepherding. To justify such expenditure, it should contain not less than 300 breeding ewes. In such a flock, 75 ewe lambs would be required for flock replacement, and the remainder disposed of in the following ways:

Disposal of lambs not kept for flock replacement

	Produced	Sold as stores	Pedigree sales
Ram lambs	200	60	140
Ewe lambs	200	—	125

Six ram lambs would be required. Each would be kept for two years in the flock.

Costs

Seventy-five lambs will be required annually to replace 60 ewes culled and 15 deaths. Three rams are replaced each year. The ram can usually be sold for cross breeding in a commercial cross bred flock, for about 25 guineas. Pedigree rams for replacement are a heavy item, and normally cost from 100 to 200 guineas. Assuming these are purchased annually, £450 has been charged for replacement.

The ewes are fed ½ lb per day of a mixture of two parts sugar beet pulp to one part of crushed oats and 10 per cent fish meal, from early December to

early April. The ration for the lambs depends on the method of their disposal. All are creep fed ¼ lb per head per day of a proprietary lamb food, from four weeks to weaning at thirteen weeks. Afterwards, the ram lambs are fed 1½ lb per day of ewe and lamb pencils until they are sold. The ewe lambs intended for the pedigree sales are fed ½ lb per head per day of one part sugar beet pulp to one part of oats. Ewe lambs retained for replacement and stores receive a similar ration until mid-May.

The cost of the concentrate feeds, therefore, will be:

	cwt
Ewes: ½ lb per head per day for 4 months of a mixture comprising 56 cwt oats, 114 cwt sugar beet pulp and 17 cwt fish meal	187
Lambs: ¼ lb per head per day from 4 to 13 weeks of proprietary lamb food	50
Ram lambs: 1½ lb per head per day of ewe and lamb pencils from 13 weeks until sale	300
Ewe lambs for sale: ½ lb per head per day, from 13 weeks until sale, of a mixture comprising 42 cwt sugar beet pulp and 42 cwt oats	84
Ewe lambs retained, and stores: ¼ lb per head per day from 13 weeks until mid-May of a mixture of 13 cwt sugar beet pulp and 13 cwt oats	26

Total cost of concentrate feeding:

	£
Sugar beet pulp: 169 cwt @ £21 per ton	177
Oats*: 111 cwt @ £15 per ton	83
Fish meal: 17 cwt @ £75 per ton	64
Proprietary lamb food: 50 cwt @ £40 per ton	100
Ewe and lamb pencils: 300 cwt @ £30 per ton	450
	874

Hay will be required to feed the flock for two months, at the rate of six 40-lb bales a day. In addition, 120 acres of kale are grown, over which the flock run during February, March and early April, and 10 acres of mangolds are fed to the ewes after lambing. The cost of this bulky food is therefore:

	£
Hay: 6 bales a day for 2 months: 130 cwt @ £6 5*s.* per ton	41
Kale: 120 acres @ £22 per acre	2,640
Mangolds: 10 acres @ £48 per acre	480
	3,161

The total food bill each year to maintain a pedigree flock of 300 ewes will be around £4,000:

	£
Concentrate foods	874
Bulky foods	3,161
	4,035

Mixed grazing is not usually practised where a pedigree flock is kept. Immediately after weaning, the flock is divided into four units—pedigree ram lambs, pedigree ewe lambs, the ewe replacements with the store lambs, and the original breeding flock.

* Home-grown oats valued at cost of production.

During October, November and December the in-lamb ewes run over about 60 acres of sugar beet tops or winter foggage. After lambing, they are folded on kale, and for the rest of the year the whole flock, still divided into four sections, will require approximately 400 acres of pasture.* This acreage normally receives a top dressing of two cwt per acre of Nitro-Chalk in the spring, and a main hay cut and a seeds cut are taken off it.

	£
Rent @ £2 per acre	800
Fertilizer—40 tons @ £12 per ton	480
Rolling @ 4*s.* 6*d.* per acre	90
Harrowing @ 4*s.* 3*d.* per acre	85
	1,455

As a hay and seeds cut have been taken off this acreage, the charge to be borne by the flock is one-third of this cost—£485.

A full-time shepherd will cost, say, £500 per year, plus a lambing bonus of 1*s.* 6*d.* per lamb tailed. He will normally require the assistance of a boy for 6 weeks during the lambing period, and extra help during shearing and dipping.

	£
Shepherding	500
Lambing: 1 boy for 6 weeks	35
Shearing: 2 men for 3 days, say	10
Dipping: 3 men for 1 day, say	5
Lambing bonus: 400 tailed at 1*s.* 6*d.*	30
	580

A 200-gallon dipping tank will be required. A further 300 gallons of dip will be needed to keep the dip at full strength, and to top up the tank. In all, five cans (to make 500 gallons of dip) of a dual purpose liquid dip will have to be bought, at £2 10*s.* a can.

The medicinal charge of a flock of sheep is essentially variable, depending on the incidence of disease within the flock. But outbreaks of disease are rare, and although flock-masters must not overlook their possible incidence, the costs incurred are exceptional and need not be included in a sheep enterprise budget. In fact, only the cost of the usual preventive medicines have been included.

Cost of routine preventive medicines

	£
Phenothiazine	
Lambs once: 400 doses Ewes twice: 600 doses	
1,000 doses @ 27*s.* per 100 doses, say	14
Foot rot medicines	
3 2-gallon drums of arsenical foot rot wash	7
12 tins (50 feet each) of foot rot dressing	4

* See "*Sheep on the Arable Farm*", by P. G. James, page 12. Farm Economics Branch, School of Agriculture, Cambridge.

	£
Dose = 2 c.c. per ewe and per lamb = 1,400 c.c. = 30 bottles	25
After lambing medicine	
10 bottles of ewe draught 10 pessaries 3 bottles of lambing oil	5
Lamb dysentery antiserum	
2 c.c. per lamb = 800 c.c. = 16 bottles	25
Veterinary and incidental charges—allow	25
	105

Annual replacement charges for equipment

	No.	Total cost	Years	Replacement cost
		£		£
Dipping bath (200 gal)	1	22	10	2
Hypodermic syringes	3	3	1	3
Hypodermic needles	18	1	1	1
Hayracks (10 feet long, on wheels)	5	105	5	21
Creep feeders (with shelter)	3	57	5	11
Drenching guns	2	13	3	4
Foot rot troughs	3	23	5	5
Troughs	10	30	5	6
Shearing machines	2	73	10	7
Shearing combs and cutters	12	10	4	2
Netting rolls (50 feet per roll)	20	85	6 a yr	25
Stakes	200	10	5	2
Iron hurdles	50	400	20	20
Wooden hurdles	50	45	5	9
Total charge		877		118
Marketing and transport				
325 lambs, 75 culled ewes and 3 culled rams @ 3*s.* each				£60

Total miscellaneous charges

	£
Dip—5 cans at £2 10*s.*, say	13
Medicine and veterinary charges	105
Equipment depreciation	118
Marketing and transport	60

Receipts

Wool. In a pedigree flock, more and better wool is produced than in a cross-bred flock. Eight and a half pounds a fleece at 5*s.* a pound can reasonably be expected. The wool return is, therefore:

291 fleeces at £2 2*s.* 6*d.* per fleece £618

Lamb sales: All the lambs are normally sold in September, producing:

	£
Pedigree ram lambs: 140 @ £30	4,200
Pedigree ewe lambs: 125 @ £12	1,500
Store lambs: 60 @ £7 5*s.*	435
	6,135

Continued on p. 235

Culling:

	£
20 ewes @ £3	60
3 rams @ £25	75
	135

Anticipated return from a pedigree flock of 300 breeding ewes

Costs		Receipts	
Flock replacement	£		£
3 rams @ £150	450	Lamb sales	6,135
Bought foods	791	Wool	618
Home-grown foods	3,244	Culled stock	135
Grazing	485		
Labour	580		
Miscellaneous charges	296		
	5,846		
Profit	1,042		
	6,888		6,888

Despite the high cost of pedigree sheep production, particularly for feeding, the system is reasonably profitable. A return of about £3 6*s*. per ewe or £3 19*s*. an adjusted acre can be expected if the farmer can depend on prices at about the level suggested. The price received is, however, the vital factor, and if a farmer lacks the skill in presenting his lambs well, or lacks the reputation, profits may be seriously affected. In the example, a fall of £5 per head for pedigree ram lambs would reduce profits by more than half.

The pedigree ram lamb market is highly specialized, and success often depends more on the skill of the shepherd and the enthusiasm of the flockmaster than on purely economic considerations. But this does not imply that such economic factors should be discounted in pedigree ram lamb production. On the contrary, profits can be raised appreciably if the system of production is geared to peak economic efficiency. In a breeding flock this is achieved by a high lambing percentage and a low flock replacement charge.

The lambing percentage is probably the most important factor influencing the final profitability of any sheep enterprise. This is due to the fact that the added receipts which result from any given increase in the lambing percentage far outweigh the added costs incurred in securing it.

In the above sample, a modest lambing percentage of 130 has been assumed. If this is raised to 150, and the extra lambs are sold in the store market, the profitability of the pedigree flock is increased by nearly £400:

Effect on profit of increasing lambing percentage from 130 to 150

Increased costs		Income gained	
	£		£
Foods	27	60 store lambs @ £7 5*s*.	435
Labour	5		
Medicines	9		
Marketing	9		
	50		
Increase in income	385		
	435		435

Probably the most significant factor which influences the lambing percentage is the level of management attained by the flock-master, as this will govern not only the condition of the ewe at lambing, and hence the number of lambs born but, what is of more importance, the number of lambs actually tailed. A balanced ewe ration before lambing, and conscientious shepherding during and immediately after it, increases the number of lambs tailed and enhances the lambing percentage. Even where the additional lambs do not make the high priced pedigree market, a high lambing percentage should be aimed at if maximum profit is to be attained.

The annual flock replacement charge is governed by two items—the value of the ewe lamb and the estimated average flock life. In a pedigree flock, the value of the ewe lamb is determined by the income forgone by not selling the lamb for breeding. This is governed by the market demand for and supply of breeding ewes, and is consequently outside the control of the flock-master. The flock life of the ewes, however, is more readily controlled, for in many instances the decision whether or not to cull rests entirely with the flock-master.

The effect on income of increasing the average flock life from 5 years to 6 is shown in the following budget:

Revenue lost	£	Income gained	£
10 culled ewes @ £3	30	10 ewes @ £12	120
	30	*Costs saved*	
Increase in income	92	Marketing 10 ewes	2
	122		122

In a pedigree flock of 300 breeding ewes, net income would be increased by nearly £100 by keeping the ewes in the flock one year longer.

Clearly, the flock life of the ewe is governed by such factors as health, milking qualities, prolificacy and so on; it is not necessarily governed by age, and yet many flock-masters still cull dogmatically on this criterion. More attention to the inherent qualities of the ewe would in many cases offset the age factor, and increase the flock life of the ewe. In this respect, flock recording can be of great assistance, for it ensures that culling is governed by the only factor that counts—performance. In an enterprise as valuable as a pedigree flock, recording should be accepted as an aid to successful management and not as extra clerical work of dubious value.

Successful sheep management can be assessed only in terms of profitability. With a moderate level of management, it has been shown that a profit of £1,000 can be expected from a 300 ewe pedigree flock. Increased managerial efficiency—measured in terms of a higher lambing percentage and longer flock life—will increase profitability by nearly £500—an increase of over 40 per cent.

Potato Harvesting Today and Tomorrow

S. J. WRIGHT, M.A.

Mechanized Farming Centre, Boreham, Essex

Could we do without potato pickers if the present ample supply gave out? What are the latest ideas in harvester design?

THE task of getting our potato crop occupies something like half a million men, women and children for an average of ten days or so every year. For all but a very few of them the job is literally what the Americans call "stoop labour": picking up the potatoes from the ground behind ploughs, spinners or elevator diggers. As yet, not more than one potato picker in a hundred rides on a harvester. Almost certainly, the main reason why complete harvesters are still uncommon is that there are still willing hands enough to do the job without them. The great majority are women, working casually at times that fit in with their domestic chores. Almost certainly, too, the thing most likely to change this situation is that other industries may offer casual employment in circumstances which the women may find more congenial than wet potato fields. With this possibility in mind, it is of interest to consider what existing complete harvesters can accomplish and how far their shortcomings may one day be overcome.

The two special difficulties which bedevil all potato lifting are likely to be well known already. One, to be discussed later, is the vulnerability of the tubers to physical damage; the other is the awkward way they grow inside a ridge of soil. However the lifting is done, getting at the crop means moving anything up to 400 tons of soil an acre. Generally, too, the ridge will contain clods and stones comparable in size with the potatoes themselves and liable, except in so far as the clods can be broken, to be left with them after the loose soil has been disposed of.

With the spinner—by far the most commonly used appliance—the whole ridge is first severed by a share and then, almost simultaneously, combed through transversely by what is in effect a series of rapidly moving two-pronged forks. The precise action is something of a mystery, but what probably happens is that most of the larger tubers are thrown sideways along with the clods and stones, while some of the smaller ones remain, with most of the loose soil. At the best, therefore, the crop is left rather widely scattered and not always clearly exposed. Nevertheless, after its fashion the spinner will work almost regardless of soil conditions, and is also relatively cheap and simple.

By contrast, the elevator digger takes the whole ridge of soil on to its chain-link web. This fills the dual role of separator and conveyor and can be given a variable degree of agitation, both to assist the riddling away of loose soil and to break some of the clods. The crop is left comparatively well exposed in a band no wider than the ridge itself. For this reason it is commonly claimed that picking behind an elevator digger can be done half as fast again as behind a spinner, while with the 2-row diggers now available the comparative advantage is greater still. But if the land is heavy and sticky the web of the elevator digger, even with full agitation, may not be able to

break down the mass of soil put on to it. Also the machine has more wearing parts than the spinner and on stony or abrasive soils may be expensive to maintain.

Elevator harvesters

Most of the complete harvesters in common use employ the same initial separating principle as the elevator digger. In fact, apart from the provision of devices to assist final sorting, they are no more than elevator diggers extended so that the pickers can ride on the machine, and so that the potatoes can be put straight into vehicles or bags. In America, where three-quarters of the potato crop is now harvested mechanically, machines of this kind are almost universal. In this country, too, harvesters with chain elevators account for the greater part of the relatively small mechanically-harvested area. Only in some Continental districts, in which potatoes are grown on the lightest of sandy soils, is the position at all different.

This preponderance of elevator harvesters is certainly not the result of anything like lack of enterprise on the part of experimenters and designers. Indeed, in this country—and if only because so many British growers have an almost fanatical antipathy to elevator chains—a great deal of effort and money has been sunk in attempts to get rid of them altogether. But no alternative has yet proved commercially successful, and of the dozen or so chain-free models that had appeared up to last year not one is still in production today. The reason is simply that no other mechanism has yet proved anything like as effective as the elevator chain for handling and getting rid of the initial mass of soil. Ability to do this is what mainly determines output in acres a day; and output—not just on a favourable day but over a typical season—is what growers look for in harvest mechanization.

The record on this point is quite clear. Of the eighteen British harvesters which took part in the R.A.S.E. trials eight years ago only two, both of them elevator machines, are still available. On that occasion they achieved a substantially higher rate of working than any of the machines without chains and, along with other elevator models introduced more recently, have done so at five out of the six demonstrations since organized by the Potato Marketing Board. In the one exception, on an easy-working sandy soil, two chainless machines worked just about as fast as the others; otherwise the more difficult the going, the more clearly the elevator chains appeared to advantage. This situation may, of course, change at any time in the future. Efforts to develop harvesters with no chains are still being made, and one new model in particular, based on work done originally at the N.I.A.E., may well have more prospects of success than its predecessors. Nevertheless, if what complete harvesters can do today needs to be weighed up, from the standpoint of growers whose labour situation is already acute, it can be done realistically only in terms of elevator machines. The broad conclusion is that whenever an elevator digger will work at all, existing elevator harvesters will do an acceptable job at not less than 2 acres a day with not more than 4 or 5 pickers; and that wherever an elevator digger will go well, they will do up to 3½ acres a day. Without harvesters, comparatively few growers do in fact regularly get their crop away at more than 2 acres a day, and to do this they need at least 10 or 12 pickers.

Crop damage

Records of damage, leavings and cleanliness of sample were made in only two of the trials on which this conclusion is based and, in the main, justification for describing the work done as "acceptable" is to be found only in the comments by interested growers that were heard at the time, and in the fact that the machines always worked subject to the approval of referees. In any case the seriousness of any damage that may be done cannot be assessed visually and at the time the work is done; and because of the incidence of indoor storage and prepackaging, what is and is not acceptable on this score may have to be reconsidered. In the past it has commonly been assumed that elevator diggers, and by implication harvesters with elevators, handle potatoes more roughly than spinners do. Anyone who has watched spinners in action at all critically is likely to question the truth of this. So far as modern harvesters, properly operated, are concerned, there is no precise evidence one way or another. On the other hand, as the result of widespread examinations made quite recently, there is good reason to believe that most of the damage serious enough to cause deterioration arises from the forking, tipping and rehandling that goes on after the potatoes are first picked up. This is why there is a growing interest in the use of pallet systems and fore loaders among growers not yet interested in complete harvesters. With these the crop is rehandled once only between picker and store; while some people who use them are now thinking of pallet storage as a means of eliminating even this one rehandling. In the near future complete harvesters are likely to be modified for loading into pallets.

Better sorting or fewer clods?

How far the present level of harvester performance is likely to be improved can only be guessed. Because of the great mass of soil that has to be taken in and digested, potato harvesters can seldom travel in work at more than about 1½ miles an hour; and so long as this is true, 3½ acres a day in favourable going will be about the limit for single-row machines. In theory, because its disc share takes rather less of the ridge, and because the mass of soil is broken immediately by a rotating spider, the N.I.A.E. machine already mentioned should be able to move faster. In practice, it seems on the whole to move even more slowly, mainly because it so easily overloads its picking table. Apart therefore from the introduction of 2-row models—and two self-propelled ones nominally capable of 7 acres a day will be working this year—overall output is not likely to increase. There is, however, much more scope for improving output per man by the development of better devices to assist final sorting. Some now in use depend on the fact that potatoes roll more readily than either clods or stones: for example, down a rough-surfaced belt moving up an incline. Such a device tends to deliver a mixture with many more clods than potatoes at the top, and with many more potatoes than clods at the bottom; and subject to making the harvester more expensive, still better separation might result from putting one of the two resulting streams over a second device of the same kind. Many other separating principles, from air blasts to electronics, are being tried experimentally and may one day prove effective in the field.

There is also the very real possibility that all potato lifting may one day

be made easier by developments in plant breeding or crop husbandry. One example, necessarily rather far in the future, is the breeding of new varieties with tubers so firmly attached to their stalks that they can be pulled out with no soil at all. Another idea suggested by experimental work now in progress —that clods are man-made and, through changed cultivations along with the use of herbicides, might be avoided altogether—may come to fruition a lot sooner.

In the meantime, and without waiting for any of these things, existing harvesters could probably deal with at least half our national acreage, and save at least a third of all the stoop labour now needed in our potato fields.

Eighth International Grassland Congress

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Zero grazing, seed production, more realistic ways of testing new herbage varieties, why soil fertility increases under grass, and grazing management —controlled versus set stocking—were among the subjects discussed at Reading on 11th–21st July.

IT is 23 years since the Grassland Congress met in Great Britain. In 1937 it was held at Aberystwyth under the presidency of the late Sir R. George Stapledon, C.B.E., M.A., and it was on this occasion—the fourth assembly—that the meeting became fully international in character. The previous meetings had been attended by delegates from European countries only, starting in Germany in 1925 under the presidency of Dr. R. Geith.

The Congress opened at Reading on the afternoon of 11th July 1960 with the presidential address from His Royal Highness the Prince Philip, Duke of Edinburgh, K.G. His Royal Highness emphasized the importance of better management of tropical grasslands, and in so doing set the scene for what was to be a truly international gathering of 600 delegates from 59 countries. There were also present 300 day members and 110 associate members from Great Britain.

Referring to the importance of integrating the findings of plant and animal physiologists with the widest range of field techniques, the Duke struck a chord in the heart of every agricultural adviser. Technical papers, important though they are, seem remote from practical farming; and it was good to be reminded that no scientific organization can do its job properly unless it takes a very active interest in the application of its findings. "It is very tempting," said the Duke, "to turn out results and expect someone else to do something about them. Scientific organizations—not individual scientists—are wasting their time unless they are prepared to go out and convince users that they can provide substantial help for them." Continuing, he said "the greatest progress in grassland work has been made in parts of the world that enjoy a temperate climate and are already industrialized. Although

much work remains to be done in these regions, the greatest potential for development lies in tropical and sub-tropical climates. The rate at which tropical problems could be solved might be fairly rapid, but the real difficulty would arise in devising methods to apply the knowledge which these investigations reveal. We have all heard the heart-cry of the agricultural scientist that farmers are stick-in-the-muds and refuse to apply scientific knowledge. I am slightly on the side of the farmer in this. It is one thing to perfect laboratory experiments but quite another to integrate them into the operations of a mixed farm with grassland as only one aspect of the farming business." This surely expresses in a few words the difficulties which everyone encounters who brings the findings of science to the notice of farmers and tries to show how they can be turned to financial advantage.

Zero grazing

Most of the world's grassland is grazed, but farmers in central Europe have long employed systems in which the herbage is cut and carried for feeding to livestock either indoors or in yards. Recent developments in harvesting machinery have drawn attention to the possibilities of efficiently mechanizing this traditional system. Many papers showed that the system does not give the increase in animal products per acre which is theoretically possible, perhaps because the system is often imposed on swards suitable for grazing. If higher animal production per acre (which is essential if the system is to pay) is to be achieved, then increasing dependence on crops adapted to a cutting system will be necessary.

One of the main difficulties of zero grazing is the provision of enough high quality forage for cutting every day. An alternative system is being studied in which most of the cut forage is conserved before feeding. The advantage is obvious: each crop can be harvested at the stage when it gives the maximum of high quality feed. Final evaluation of the system must be deferred, pending a critical study of the economics of feeding forages which are cut when their nutritive value is high and fed directly or after efficient conservation.

Seed production

A northern country may not be well adapted to the economic production of seed of varieties bred there, and great interest was shown in the possibility of growing seed of such varieties on a larger scale in more suitable environments. If these ideas materialize, it is vital that the stock seed should not deteriorate, and this point is receiving critical study. It seems that as long as fresh stock from the country of origin is continuously introduced into the seed-producing area, in preference to establishing new stands from seed grown in that area, the danger of deterioration can be minimized.

It is said that improved varieties of most forage crops are not used as widely as they should be, so that the benefits from plant breeding are limited. One reason for this may be the wide fluctuations in supplies and seed prices. In discussing this problem, delegates emphasized that if better seed statistics were available at national and international level it would be possible to arrange for a more uniform supply of seed of improved varieties. With this

in mind Mr. C. S. Garrison, from the United States, moved the following resolution at the last business meeting of the Congress:

1. That FAO be requested to urge its member countries to improve and extend the compilation of statistics of seed carry-over, consumption and production, areas of herbage seed crops, yield forecasts, imports, exports, etc.
2. That when such information is available nationally, FAO be requested to assemble and collate it at regular intervals, and disseminate summaries to its member countries.

The resolution was adopted.

Testing new varieties

Breeding better herbage varieties is now being undertaken in many countries, but there is still great argument on how precisely to evaluate the new products. The problem is this. These grasses are intended for animal production, but it is quite impossible to undertake a critical animal production experiment on the hundreds of varieties produced each year. Various systems of testing on a small scale have been developed, the aim being to examine only the most promising material in later animal experiments.

The most widely used method of studying new grasses is to plant out single plants of each variety in rows and measure various characteristics such as leafiness, earliness and yield. Several papers at the Congress questioned the validity of this technique, on the grounds that the behaviour of a grass sown as single plants may differ completely from its behaviour when it is sown in a sward with an accompanying legume. This is particularly true when dealing with grasses bred primarily for grazing. New methods of testing, taking into account the limitations of single plant studies, are therefore being developed. These should lead to much more realistic methods of testing new herbage varieties.

Grass and soil fertility

Soil fertility increases when land is in grass; exactly why this should be so is only imperfectly understood. Some light was shed on the problem by Mr. T. E. Williams, Deputy Director of the Grassland Research Institute at Hurley. He showed that, on certain soils, increased corn yield following a period under grass was due almost entirely to an increase in the nitrogen content of the soil. Grassland management systems which lead to a high build-up of nitrogen (grazing systems ensuring a high return of dung and urine and a spread of clover) give higher yields of subsequent arable crops than more exhaustive systems—for example frequent cutting and removal of the cut herbage.

In many areas of the world the fertility build-up will depend largely on introducing the right legume into the sward, but in the tropics disappointing results have followed the adoption of this practice. There are several possible reasons for this failure of legumes to improve soil fertility in tropical regions. The legumes grown have been mainly annual crops in which nearly all the atmospheric nitrogen fixed by the plant is harvested. Relatively few forage legumes have been studied; it seems clear from the more comprehensive studies now being made that some legumes are likely to be well adapted to

tropical conditions. Potentially suitable legumes introduced into the tropics may be planted in soils which do not contain the necessary soil bacteria. Many soils are likely to be deficient in minerals which are essential to the establishment of the legumes (for example, molybdenum, sulphur). All these aspects of the problem are now being studied, and the prospect of vigorous legume swards growing in the tropics opens up enormous possibilities for increasing world food supplies.

Grazing management

The question of controlled versus set stocking was thoroughly ventilated by delegates. The differing viewpoints derive from interpreting information based on grassland experiments conducted in the absence of stock, an approach which the animal man deplores with emphasis—not to say derision. The great protagonist of the animal school is Dr. McMeekan, Superintendent of the Ruakura Animal Research Station, New Zealand. He stated bluntly that pasture production cannot be considered independently of animal production, and went on to give three basic factors which determine the efficiency of conversion of pasture to animal products: the amount, quality and seasonality of the pasture crop, the proportion of this crop harvested by the animal, and the efficiency of conversion within the animal of the fodder consumed.

He then described his recent experiments. Four farms were involved, two managed on a set stock basis and two on a controlled rotational basis. Under each grazing method one farm carried a low rate of stocking and the other a 30 per cent higher rate. This meant that three years ago, when the experiment started, there were 40 cows on 42 acres on each of the low stocked farms, and 40 cows on 33½ acres on the high stocked farms. These rates were maintained for two years, after which two more cows were added to each farm. All the farms were completely self-contained in feed provision.

The results show that the increased stocking rate under both systems reduced the production per cow but increased the production per acre. Controlled grazing was superior to set stocking under both high and low stock density. By comparing mean differences between treatments two conclusions were drawn: controlled grazing must be associated with high stocking rates to exploit fully the greater efficiency of the more intensive grazing method; and increasing the stocking rate will not give as great a rise in output per acre under set stocking as it will under controlled grazing.

The still higher stocking rate in the third year of the experiment gave a not unexpected result. The extra two cows (40 + 2) on the 33½ acres broke down the set stocking system; the drop in yield per cow brought production per acre lower than that from the same number of cows on 40 acres; the cattle, too, were in worse condition, being 70 lb per head lighter.

A five acre pilot area, set up within the experiment to give herbage yield data, proved conclusively that the greater output per cow and per acre from the controlled system, as compared with the set stocking, was not due to differences in the total yield of herbage.

At the final business meeting, presided over by Dr. H. G. Sanders, deputizing for His Royal Highness, it was announced that the next Congress would be held in Brazil in 1964.

Corn Growing on the Dairy Farm

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Throughout south-east Somerset, some corn is grown on dairy farms. Why is this, and in what circumstances does it pay?

The south east of Somerset is predominantly a dairying area, with ninety per cent of the land in grass. Annual rainfall is between 30 and 35 inches, and there is a wide range of soil types, from the sandy loams of the Upper Lias to the heavy soils of the Oxford Clay and Lower Lias. In all parts of the area, however, some corn is grown, and the conditions under which this is justified deserve consideration.

Oats are the traditional grain crop of the wetter, mainly livestock areas of the country, but under present conditions oats have fallen into disfavour. In yield, they do not compare with available wheat and barley varieties. They are far more likely to lodge, and are less suitable for combining: they will not be considered in the arguments that follow.

The low capital requirements of corn growing, if use is made of contractors' facilities, are an obvious attraction to the newcomer to farming. On the established dairy farm, winter wheat in particular offers a good opportunity for cashing in on stored fertility, and it can be grown without creating a labour problem, which may be one of the disadvantages of a cash root crop. Barley can be retained and fed on the farm, so saving the cost of purchased foods.

Provision of straw for bedding is an important asset. Prices as high as £10 per ton were charged here in Somerset for straw in the spring of 1959, although farmers who are near enough take their balers into Wiltshire after harvest, when straw can be had very cheaply. Where cows are tied, needs may not be very great. For example, on a farm in this area where cows are kept in sheds with automatic ties and milked through a parlour, straw requirements average 2 lb per cow per day, or approximately 3 cwt per cow over the winter. But with the emphasis in cow management on labour saving, more dairy farms are changing to systems of loose housing. Under these conditions, straw requirements may rise to one ton per cow, which could be met for a 40 cow dairy by growing 25 acres of wheat or 40 acres of barley. Barley straw also has a limited value as a feed for dry cows and in-calf heifers. Any straw surplus to the farm's own requirements should find a ready sale near by.

Winter wheat can provide valuable spring grazing for cows when sown on well drained land. The evidence, however, is that yield will suffer if grazing is prolonged much after early April. An instance of the value of this grazing was provided near Castle Cary in the spring of 1960, when keep was very short following an exceptionally dry summer. A herd of 37 Friesians giving 120 gallons of milk a day was maintained on 40 acres of winter corn, mainly wheat, for five weeks from the beginning of March. The supplementary food the cows received during this time amounted to 5 lb hay per head per day plus 140 lb concentrates per day for the whole herd. Approximately 20 lb

hay per head plus 480 lb concentrates per day would have been needed to produce the same quantity of milk if the grazing had not been available. Thus the grazing saved a food bill for about 8½ tons of hay and 5 tons of concentrates. At the time, hay was making £20 per ton, so the saving amounted to some £330, or put another way the value of the grazing amounted to just over £8 per acre. Although rye and Italian ryegrass can provide similar early grazing, these cannot be sown as late in the autumn as winter wheat, which can therefore be particularly valuable when the late summer and early autumn are very dry, as in 1959.

Perhaps the greatest attraction of corn growing as opposed to keeping cows is that it is a much less arduous and less worrying method of making a living—a fact which many dairy farmers do not appear to appreciate. Whether the returns from corn growing are commensurate with those from dairying can be decided by budgeting.

Budgeting for cows or corn

The common situation on the dairy farm at the present time is to find cow numbers increasing, as grassland management improves and more fertilizer is used. Table 1 examines the extra income obtainable at different levels of cow and corn yields from 20 acres of land which have become available on an established dairy farm as a result of increased efficiency. The returns from

Table 1

Extra income from cows and corn on 20 acres

	10 cows 1,000 gal £	10 cows 750 gal £	7 cows 1,000 gal £	7 cows 750 gal £		20 cwt/acre barley £	30 cwt/acre barley £	40 cwt/acre wheat £
Milk	1,500	1,125	1,050	788	Grain	400	600	800
Calves	72	72	32	32	Deficiency payment	160	160	280
					Straw	45	60	120
Total extra output	1,572	1,197	1,082	820		605	820	1,200
Bought food	480	240	336	168	Seed	80	80	80
Herd replacements	150	150	59	59	Fertilizer	60	60	80
Fertilizer	60	60	60	60	Spraying	40	40	40
Miscellaneous	60	60	42	42	Combining	90	90	90
					Baling	22	30	60
					Drying	40	60	80
					Miscellaneous	20	20	20
Total extra input	750	510	497	329		352	380	450
Extra income	822	687	585	491		253	440	750

10 extra cows with a 1,000 gallon and 750 gallon average are compared with 7 cows at 1,000 and 750 gallons and corn yields of 20, 30 and 40 cwt per acre. A stocking rate of one livestock unit per 2 acres has been assumed, and the different cow numbers refer to herds where replacements are bought or home reared. If the financial results for the cows assumed in Table 1 are to be obtained, regular calving is necessary, and the home-reared herds are

likely to be superior to the flying herds in this respect. The cow budgets assume that the extra numbers can be carried without adding to the existing farm labour force. The corn budgets are based on the greater part of the work being carried out by contract, although ploughing, seedbed cultivations and drilling are considered to be done by existing farm labour and equipment. Interest on the extra capital required for any of the alternatives has not been charged.

The price taken for milk has been 3*s*. a gallon. Both wheat and barley have been entered at 20*s*. per cwt, and straw has been valued at £3 per ton. Purchased foods have been assumed to be 30 cwt for the 1,000 gallon cows and 15 cwt for the 750 gallon animals at £32 per ton. This gives rates of 3·4 and 2·2 lb per gallon respectively.

The budgets show at once that a low corn yield (20 cwt per acre) produces far too small an extra income for the dairy farmer, who has the alternative of keeping some extra cows. At 30 cwt per acre, returns are similar to moderate-yielding cows in a herd where replacements are reared. At 40 cwt per acre, returns are better than for the high-yielding home-reared herd or the moderate-yielding flying herd, and approaching those for the high-yielding flying herd. But as corn yields need to be high to compare favourably with cows, it becomes obvious that in general the first consideration must be to build up a herd which is itself an economic unit, and here probably the most important consideration is labour. Given the correct layout, one man should be able to milk a herd of 40 cows, and on the size of farms capable of supporting this number (80 acres where replacements are bought, and 110 acres where replacements are home reared) the aim should be to build up to a full herd with, eventually, no corn growing. On this type of farm the basic labour force would be the farmer plus the cowman. Only where accommodation problems make it impossible to keep up to 40 cows is it going to be worth while to grow an appreciable acreage of corn on this size of farm.

Problem of additional labour

When the one-man cow unit has been reached and there is still extra land available, a new situation is presented. In Table 2 the extra income from corn (30 cwt barley per acre) is compared to the extra income from cows, where cow income is depressed by subtracting the cost of an additional man (£600) from the output. Extra income figures for 40 acres of corn have been arrived at on the assumption that 10 acres of the ploughing will have to be done by contract, and that some casual labour will be needed at harvest. It will be noted that extra income from 50 acres of corn is lower than from 40 acres: this is on the basis that at about this stage it will no longer be practicable to rely so heavily on contract labour, and the farmer will have to invest in his own machinery and employ a tractor man.

Even where cow output is very high, it will be more profitable to grow up to 30 acres of corn than to keep extra cows, if this necessitates the employment of an additional cowman. It can be argued that where there are other productive enterprises on the farm, most commonly pigs or poultry, and a proportion of the additional man's time is spent working with these, then the full wages should not be charged against the cows. But to avoid complica-

tions I am concerned here only with the farm where dairying is the major enterprise and corn the only important side-line.

Where an extra cowman has to be employed, up to about 40 acres of corn is a better proposition than extra cows on the medium output dairy farms, provided good contract services are available. High investment in machinery and extra labour for corn are economically justified only on the relatively low output and larger dairy farms, although other considerations—principally the wish for an easier life—may influence a farmer to make this investment. If he can get high corn yields, he will not be dissatisfied. Also, it might well pay a farmer whose cows were badly managed from a labour point of view to reduce the herd, if at the same time he can reduce his staff and grow corn on the land released.

Table 2

Extra income from cows and corn at increasing acreages where an additional cowman has to be employed

	20 acres £	30 acres £	40 acres £	50 acres £
Flying herds, averaging: 1,000 gal	222	633	1,044	1,455
750 gal	87	431	774	1,118
Self-contained herds, averaging: 1,000 gal	−15	278	570	863
750 gal	−109	137	382	628
Barley yielding 30 cwt/acre	440	660	850	699

In this district, most of the corn is grown on dairy farms over 150 acres. Very often these have a combine, even where there is less than 50 acres of corn, but some contract work is done for neighbouring farmers. On the smaller farm, one field of corn may be grown with the main aim of providing bedding for cows and pigs. In general, yields are very satisfactory and winter wheat has been outstanding, with a number of crops giving over 2 tons per acre of grain in 1959.

Cures for possible difficulties

Harvesting the corn will be the dairy farmer's main worry. To obviate this it is almost certainly worth while for him to install a small in-sack drier (£150 initial fixed cost, plus 12*s.* to 15*s.* per ton of corn dried for electricity), even where only 20 acres of corn are grown. Selling the corn as seed at a £5 per ton premium, against which has to be set the cost of cleaning and dressing at 30*s.*, is a possibility, but this is a job better suited to the larger corn grower with specialized equipment.

Cereals are best grown on the medium and lighter soils, and should not be attempted on the heavier land unless this is drained. Only a part of many dairy farms is likely to be suitable for corn, and the danger of over-cropping this land must be avoided, or take-all and eyespot will reduce returns. Farmers in south-east Somerset are obviously not paying sufficient attention to this, and both these diseases are widely spread through the district. A suitable rotation could be 3 to 5 years grass followed by winter wheat followed by one or two spring barley crops, but as large an area of the farm as possible should be cropped rotationally. Barley has the advantage over wheat

that in a wet harvest the moisture content of the grain falls more rapidly after rain. Many dairy farmers still undersow their corn and are troubled by the amount of green material during a wet harvest. With early-ripening cereal varieties, it will generally be better practice in Somerset to sow the ley immediately after harvest. Although birds are often considered an additional hazard to corn growing in a grass district, they are not usually troublesome except when a crop has lodged. Proper attention to detail should normally prevent this.

I thank Mr. S. R. Wragg of the Agricultural Economics Department, Bristol University, for helpful advice during the preparation of this article.

Research and the Farm

AN increasing flow of technical information of value to farmers, horticulturists and others interested in food production is coming from the Ministry of Agriculture's twelve Experimental Husbandry Farms and seven Horticulture Stations. To spread the knowledge of this work and its results, the Ministry has published the first of a series of annual reports.* This does not attempt to be comprehensive but illustrates the type of work which is conducted under the Ministry's experimental programme and the lessons which can be drawn. Items have been selected where conclusions of value to the producer can be reached, and experience gained from many separate experiments is summarized in a number of articles. There are also notes on special agricultural and horticultural problems, many of which are of more local importance. In future reports other suitable topics will be reviewed, so that over the years the full range of investigations is covered.

Agriculture

The two major articles on agriculture review fodder conservation and cattle rearing. In silage and haymaking experiments on five of the husbandry farms, the first extensive attempt has been made to measure on a practical farm scale the losses of nutrients between the field and the animal. A range of experiments on calf rearing has shown the possible savings in cost by the use of early weaning techniques and by turning calves out to grass much earlier in spring than is normally the practice on many holdings. The notes on special problems include one on grassland in smoke-polluted areas and another on alternatives to wintering away for ewe lambs.

Horticulture

An account is given of extensive trials of glasshouse heating and ventilation, carried out with the National Institute of Agricultural Engineering, in which the importance of even temperatures throughout the house is stressed. The method of testing varieties of vegetables adopted by the National Institute of Agricultural Botany in collaboration with the Experimental Horticulture Stations is also described. The need for continuous testing of cross-fertilized plants, like the majority of vegetables, is discussed and the procedure illustrated by reference to work on early cauliflowers. In the notes on special problems some work on the effect of weather on the forcing of rhubarb is reviewed, also some studies on shelter for horticultural crops.

* *Experimental Husbandry Farms and Experimental Horticulture Stations—Progress Report 1960.* Obtainable from H.M.S.O., or through any bookseller, price 4*s.* 0*d.* (by post 4*s.* 4*d.*).

Pigs in Northern Ireland

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The last few years have seen important changes in pig housing, fattening and rearing in Northern Ireland, where bacon production is the mainstay of the farming industry.

WITH the number of pigs in the country approaching the million mark (and going up steadily year by year), Northern Ireland may soon have as many pigs as people. Every week some twenty to thirty thousand pigs are sold from Northern Irish farms, and virtually all are used for curing at bacon weights. In fact Northern Ireland has been producing more than ten per cent of the bacon sold on the United Kingdom market, and has accounted for almost a third of the total U.K. output.

The steady rise in production may seem anomalous when one remembers the difficulties through which the English bacon industry has been passing, but it has resulted from a number of features which are peculiar to the pig industry in Northern Ireland. Firstly there is no outlet for pork pigs and no market for heavy hogs. The relatively small amount of pork eaten locally can be supplied in the form of by-products from the bacon industry, and the shipping of chilled carcasses to England is very costly. Thus if farmers in Northern Ireland are to produce pigs at all they must sell them for processing into bacon.

Moreover the Pigs Marketing Board, which buys all the bacon pigs from our farms, has been able to maintain very level prices over the past few years, and this has resulted in a high degree of confidence among producers. When bacon is selling well the Board puts money into reserve, and can use it to maintain pig prices when the market is bad. Lastly it is probably true to say that producers in Northern Ireland have preserved, and increased, the numbers of pigs on their farms because they have had very little alternative. The country is one of small farms and many producers have few, if any, alternative sources of income. Poultry and pigs form the main enterprises on large numbers of holdings, and in recent years pig production has been perhaps the more attractive of the two.

In a country catering entirely for the bacon market it is not surprising to find bacon breeds predominating. In fact Large Whites, Landrace and crosses between the two account for nearly all the pigs in Northern Ireland. Coloured pigs are seldom seen, and the old Large White Ulster breed has virtually disappeared.

Since the first Swedish Landrace pigs were introduced in 1953 the influence of the breed has gradually increased. In a recent survey it was found that over a third of the pigs marketed alive showed "Landrace characteristics" and that these had rather better grading than the others. Thus 37 per cent of the "Landrace type" pigs graded AA+, compared with 31 per cent of the "non-Landrace" pigs; the corresponding figures for AA pigs were 64 and 58 per cent. These figures show some superiority in the grading of "Landrace

type" pigs, but nonetheless there are many really good strains of Large White, and it would be difficult to say which is the better breed for bacon production.

Breeders separate from fatteners

One of the most notable characteristics of the pig industry in Northern Ireland is the dichotomy between breeding and fattening. A high proportion of the pigs are bred on one farm and sold for fattening on another. Generally speaking the breeders operate small units, with perhaps three to five sows, while the fatteners are often working on a much larger scale. This division into separate breeding and fattening units is unfortunate, since it inevitably slows up the rate of improvement which can be made by selective breeding. When the breeder never sees a grading docket he has neither the incentive nor the information for culling his sows according to the excellence of the stock they produce.

The system is brought about largely by the small size of the average farm. The small farmer can provide the detailed attention required by farrowing sows and young pigs, but he often lacks the capital and buildings necessary for fattening the latter to bacon weight. He obtains a quicker return by selling them as weaners or stores. The larger farmer, on the other hand, can provide the capital for fattening, but probably does not want to be bothered with farrowing sows and the troubles which seem to be inseparable from large breeding herds.

Farrowing units

Wooden farrowing crates have long been a feature of breeding units in Northern Ireland. Over the years they have proved very successful in reducing losses due to overlying and chilling. The main disadvantage of the conventional crate has been the labour needed to let sows out, and put them in again, twice daily—so that they can dung, urinate and feed outside the crate. If a sow is initially put into the crate a few days before farrowing, and remains there with her litter for five days afterwards, the labour involved can be considerable. For this reason there is a growing tendency to replace the conventional crate by a farrowing pen designed to save labour. Two types seem to be popular and successful: the "creep and gate" pen, and a modified farrowing ring.

The "creep and gate" pen is a dual purpose device for both farrowing and rearing. A simple pen some 10–11 feet long and 6–7 feet wide is equipped with a covered creep at the end farthest from the door. The creep is fitted with an infra-red lamp, runs the full width of the pen and is $2\frac{1}{2}$–3 feet from back to front. When she is actually farrowing the sow is confined alongside it by a movable "gate", which is removed soon afterwards. "Gate" is actually a misnomer, because it should be a solid barrier coming to within ten inches of the floor and designed to prevent draughts. The bottom ten inches are occupied by an escape box (similar to a side box on the old type of farrowing crate) so that piglets will not be crushed if trapped on that side when the sow lies down.

A modification of the New Zealand farrowing ring has been in use here at

Hillsborough for almost two years. It has proved very successful, having reduced losses to about 7 per cent, and has been copied by many farmers with good results. This is purely a farrowing unit, and the Hillsborough system is to move sow and litter to rearing quarters when the young pigs are 1–2 weeks old. The size of pen and the internal measurements are more critical in this type of accommodation. It probably gives a safer environment for young piglets and tends to find favour with farmers having moderate-sized, or large, herds.

Swing to indoor rearing

In the ten years after the end of the war, many farmers reared their pigs outdoors on grass. Normally they used fully insulated McGuckian huts. Whilst outdoor rearing in this type of hut is frequently very successful, there has nevertheless been a marked swing towards keeping young pigs entirely indoors. The climate in Northern Ireland is such that sows tend to reduce the ground to a quagmire, and it must be admitted also that in a wet climate it is more congenial to tend pigs which are kept indoors.

The swing to indoor rearing, coupled with the larger number of pigs now being kept, has helped to emphasize the disease problem. Scouring in young pigs seems to be becoming increasingly common. There is a growing realization that intensive pig-rearing in indoor pens requires a very high standard of hygiene: pens must be washed, disinfected and rested at frequent intervals.

Early weaning seems to have suffered the same fate in Northern Ireland as in other parts of the British Isles. Many farmers have tried it, but initial success has often been followed by a breakdown in piglet health, and the method has eventually been abandoned. On the other hand a system of outdoor early weaning in small insulated huts (floor area five feet by four) has been developed here at Hillsborough. This has been very successful, and is being copied with good results by some farmers: there seems to be little doubt that when it is practised intelligently this system overcomes the disease problem.

Even though 2- to 3-week weaning is not being practised extensively, there has been a general trend towards removing pigs from the sow at earlier ages. Farmers who used to wean at 8–9 weeks are often doing so now when pigs are 6–7 weeks old. Increased knowledge of pig nutrition, the coming of antibiotics and the high standard of present-day creep feeds have made 6-week weaning very successful on many farms.

Changes in fattening systems

The changes in rearing methods outlined above have been paralleled by equally important changes in pig fattening systems. In the immediate post war years, *ad lib.* feeding with automatic feeders was almost universal in Northern Ireland. The reliance on the bacon market and the tightening up of grading standards have ensured that nearly all pigs are now subjected to some degree of feed restriction. This has been a major factor in bringing about a very notable improvement in grading results during the last five years.

Meal mixtures have also changed. Most noticeable has been the acceptance

of copper sulphate as an ingredient of growing and fattening diets. Less spectacular, but equally important, has been the advent of powdered vitamin supplements. There has also been a trend towards the use of meal mixtures of higher energy content, and this in turn has resulted in more economical feed conversion and better growth rates in young pigs.

Most striking of all have been the developments in pig housing during the last fifteen years. The "Scandinavian" houses built in the 1930s usually lacked the high degree of insulation so necessary for the achievement of good results in this type of building. Subsequently many farmers built McGuckian type fattening houses with outside dunging yards, and others copied the Harper Adams pig parlour. Now, however, there has been a swing away from the outside yard, and the most recent development has been the so-called "Turkish bath" house.

In its simplest form, this is essentially a loose box with a pig to every five or six square feet of floor space and only a moderate degree of insulation. Ventilation is very restricted, so that temperature and humidity are both high. The "Turkish bath" atmosphere seems very effective in keeping disease at bay, and there is usually a notable absence of pneumonia. Moreover with this system new houses can be built for less than £4 per pig space. Sludge systems of manure disposal have become increasingly common in all types of house, with consequent benefit to the labour bill.

Further progress in the pig industry will depend upon the breeding of still better pigs, for it is difficult to visualize any very striking changes in feeding or management methods. An Accredited Herd scheme has now been in operation for some time, and farmers can look forward to progressive improvement in breeding stock.

Feeding Maize Silage

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Early trials and farm experience suggest that maize silage can be a very valuable feed for all stock, and that its comparative cheapness and fattening potential show to particular advantage in beef production.

As a result of the success of trials and from farm scale experiences, mainly in the south and east of England, the acreage of maize grown for silage in this country, whilst still relatively small, has increased this season from approximately 1,000 to over 5,000 acres. So far the main experimental work in this country has been concerned with varieties, plant densities, fertilizer treatments and chemical weed control, and recommendations on these aspects of the crop can be made fairly accurately. But we still know too little about the feeding value of maize silage.

Most of the experimental information available is based on work in the U.S.A. Typical of such results are a series of experiments at Purdue University,[1] which show that 2,000 lb of maize silage and 150 lb of concentrate supplement (at 3½ lb per head per day) will produce 100 lb of choice beef (roughly equivalent to our Grade A) at a liveweight gain of 2·08 to 2·48 lb daily, without feeding any dry roughage. Results of trials in Michigan[2] show that with dairy cows a ration of about 50 per cent hay (at least 10 lb per head per day) and 50 per cent maize silage gives best results for milk production. With both ewes and lambs in Michigan the best results have been obtained when hay at the rate of 1–1½ lb per head per day has been fed with *ad lib.* maize silage.

Chemical analyses of maize silage vary with the method of storage (most American figures are based on the use of tower silos), and in particular on the stage of cob development at harvesting. For silage, maize in this country is normally harvested at the "cheese" stage, at the end of September or early October. The resultant silage should have a dry matter content in the region of 20 per cent, a starch equivalent of 10 to 12, and a protein equivalent of 1·0 to 1·2—that is to say, an SE/PE ratio of 10:1.

Thus maize silage is a relatively low protein feed which seems well suited, in view of the now generally accepted lower protein requirement for beef production,[3] to be the main constituent of a fattening ration.

As reported in the May issue of *Agriculture*,[4] a successful eleven acre crop of maize, which was subsequently very satisfactorily harvested in mid-September by means of an attachment to a flail type harvester, was grown during the 1959 season at Harper Adams Agricultural College. The resultant silage—some 200 tons—which was made in a surface silo and a small (80 ton) tower silo, was used in the course of a series of feeding trials involving 38 Hereford and Hereford cross bullocks. These were bought in lots during the September and October store cattle sales in the west Midlands at live weights varying from 7 to 8½ cwt, and at prices ranging from £52 to £65 a head.

They were put out to grass until 16th November 1959, during which time they received supplementary hay and/or timothy straw, and then yarded (allowing 55 sq. feet per animal), with individual yokes and manger divisions, from that date until sold fat in April 1960. Up to 30th November 1959, the ration consisted of 40 lb of grass silage (pH 5·3, dry matter 19·1, and crude protein 2·1), 7 lb of hay and 5 lb of a concentrate mix consisting of 1 part wheat, 1½ parts barley, 1½ parts dried sugar beet pulp and 1 part beans. On 30th November the animals were weighed, split into four groups and numbered by means of a cold brand preparation. Subsequent weighings were made at fourteen-day intervals until disposal. For the next month the two heavier groups (average 980 lb) were fed 60 lb grass silage and 3 lb concentrates, and the two lighter groups (average 880 lb) received 50 lb grass silage, 7 lb hay and 2 lb concentrate. In both cases liveweight gains were low, and ranged from 0·47 to 1·17 lb per head per day.

Liveweight gains

On 30th December the maize silage feeding trial began, and the subsequent liveweight gains are given in Tables 1 and 2.

Table 1

Daily liveweight gains of 18 Hereford and Hereford cross bullocks on maize silage and supplement

Average weight (at 14-day intervals)	Increase	Daily increase (per head)	Range of daily gain or loss (per head)
lb	*lb*	*lb*	*lb*
1,000·23	—	—	—
1,037·06	36·83	2·63	−4·5 to +5·86
1,073·41	36·35	2·60	+1·14 to +8·93
1,097·59	24·18	1·73	0 to +5·29
1,133·06	35·47	2·53	+0·86 to +4·14
1,148·76	15·70	1·12	−0·79 to +2·86
1,193·53	44·77	3·20	+2·07 to +5·36

Total increase 193·3 lb.
Average daily increase per head 2·33 lb.
Range of liveweight gain 147–248 lb (+1·77 to +2·99 lb per head per day).

Table 2

Daily liveweight gains of 20 Hereford and Hereford cross bullocks on maize silage, hay and supplement

Average weight (at 14-day intervals)	Increase	Daily increase (per head)	Range of daily gain or loss (per head)
lb	*lb*	*lb*	*lb*
863·25	—	—	—
891·10	27·85	1·99	−1·35 to +4·0
923·95	32·85	2·35	+1·29 to +3·86
941·75	17·80	1·27	0 to +2·86
958·15	16·40	1·17	−1·0 to +3·07
984·35	26·20	1·87	−0·9 to +5·21
1,021·45	37·10	2·65	+0·64 to +5·64

Total increase 158·20 lb.
Average daily increase per head 1·91 lb.
Range of liveweight gain 101–198 lb (+1·22 to +2·39 lb per head per day).

The rations for the heavier animals (Table 1) consisted of 80 lb maize silage and 4 lb of an experimental maize silage supplement, with an S.E. of 63·54 and a protein content of 14·84. The following analysis of the maize silage, taken on 15th February, is typical of several.

Table 3

Analysis of maize silage

	As received	Dry matter content
	per cent	*per cent*
Water	79·1	—
Oil	0·5	2·2
Protein	2·0	9·5
Fibre	5·4	25·8
Ash	—	7·0
Calculated P.E.	1·3	6·1
Calculated S.E.	11·4	54·5
pH value	5·5	—

A more detailed analysis showed that the proportion of the various acids in the maize silage did not differ widely from those in "average" grass silage. In some of the samples taken the ash content was high, with a resultant lowering of the starch value, and this emphasizes the danger of soil contamination. Hence the need for a harvester setting which will reduce soil uptake to a minimum—perhaps even at the expense of some loss of the maize stalk.

Maize silage was very palatable and readily taken by the cattle. No difficulty was experienced in changing the ration over from grass to maize silage, despite the coarser texture of the latter. Attempts to increase consumption above 80 lb a head met with little success, and it seems that with the type and weight of animals on trial, 80 lb is the most that can be allowed per day.

The ration for the lighter groups of animals (Table 2) consisted of 55 lb maize silage, 5 lb hay and 3 lb supplement. It will be seen that the average liveweight gains with the lighter hay-fed beasts (1·91 lb a day) were not as good as those achieved with the heavier, all-silage-fed group (2·33 lb a day). In both cases wide variations occurred between weighings, emphasizing that liveweight gains with cattle, even under relatively uniform conditions, fluctuate widely (the drop at the sixth weighing with the heavier beasts was partly due to the fact that an attestation test had been conducted the day before weighing).

No adverse effect on carcass

The maize feeding stopped at the end of March, and from then until disposal during April all animals received a ration containing stockfeed potatoes, hay and a home-mixed ration. All 38 beasts were marketed through the F.M.C., and a carcass evaluation was obtained for each. Owing to the trial work some of the cattle were marketed at higher weights than are considered ideal in the area. However, 28 graded "A" and the grader's report stated that there was no adverse effect on the carcass as a result of feeding the maize silage. Fat colour was excellent, and a notable feature was that the amount of kidney fat was very low. The average corrected cold carcass weight per animal was 628 lb (range 540–720 lb) and the average return per animal £85 6*s*. 4*d*. (range £78 10*s*. 9*d*.–£94 10*s*.).

During the period on maize silage the liveweight gains had been obtained at a cost of approximately one shilling per lb.

These feeding trials were part of a longer-term trial involving intensive methods of beef production, which will eventually incorporate a tower silo, a mechanical unloader and an auger feed. The latter was used for part of the time during the maize silage feeding, and a mixture of silage and supplement was conveyed down a central manger to the cattle, which experienced no difficulty in feeding by such methods. Further trials involving the complete system will be conducted this coming winter.

Reports[5] of feeding maize silage to dairy cattle in this country speak of favourable results with amounts up to 60 lb per head per day, and in a private communication Mr. W. E. Cave reports satisfactory results with self-feeding maize silage to dairy cows during 1958—provided the face was kept reasonably dry—and to young stock (after molassing for the feed value, not as an additive) in 1959.

During last winter some of the maize silage at Harper Adams was given *ad lib.* to ewes, which readily consumed 2–3 lb per head each day. A small quantity of maize silage made during 1958 was satisfactorily used that winter for feeding to young stock.

Experience at Harper Adams and elsewhere suggests that maize silage is an extremely valuable feed for all classes of stock and that, in particular, its comparative cheapness and fattening potential enables economical liveweight gains to be obtained in beef production.

I am grateful to the Principal, Mr. W. T. Price, colleagues on the staff, and the Farm Department for their encouragement and assistance in the above trials.

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5. Report of Meeting on Maize organized by the N.A.A.S. at Reading 1960, **6**, 8–13. Edited by L. C. SMITH and E. S. BUNTING. A.R.C. Unit of Experimental Agronomy, Oxford.

Loose Housing of Dairy Cows

T. E. KING

Agricultural Land Service, Reading

Mr. King sets out the principles which should govern the planning of a loose housing system for dairy cows. The A.L.S. exhibit at the London Dairy Show on October 25th–28th will have a similar theme.

IN many districts loose housing and parlour milking are rapidly replacing the cowhouse, but some of the new and converted units are not achieving the benefits claimed for the system. In fact investigation in some cases would prove them less efficient than a modern cowhouse with a well-organized work routine and up-to-date equipment.

These failures are caused by lack of knowledge of the basic requirements when planning the buildings, and a haphazard work routine within them. It is of first importance to remember that the Milk and Dairies Regulations state that "the condition in which cows are kept shall be such as to prevent gross and unavoidable soiling of the animals".

Concern is felt by the Ministry's milk testing service that these provisions of the Regulations are not being complied with in every case. Failure to observe *any* of the requirements of the Milk and Dairies Regulations may lead to suspension or revocation of the T.T. licence or the taking of other statutory action against the registered producer.

Before attempting to produce a layout plan you must have a policy of cow

Portable containers for tail to tail feeding at Roke Farm, Oxford.

Permanent mangers, also for tail to tail feeding, at Marsh Green Farm, Isle of Wight.

Rindless Square Cheeses (Article on pp. 363–7)

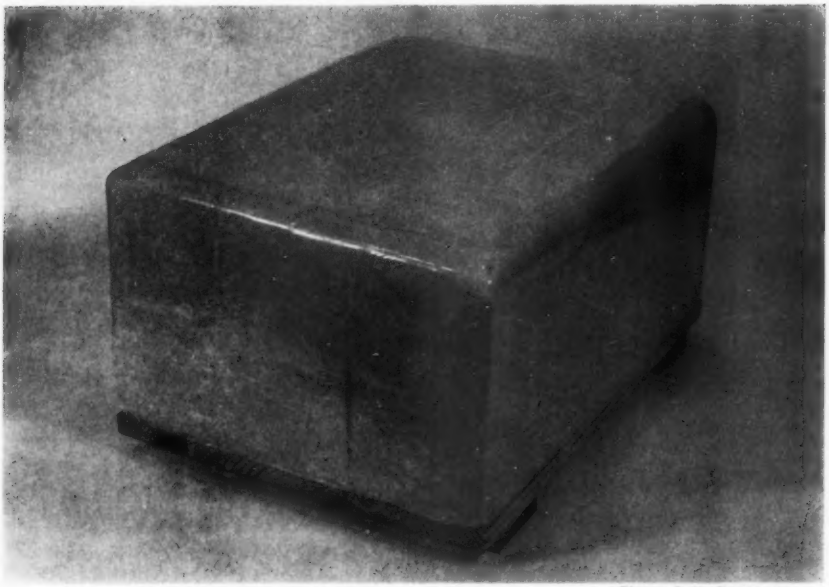


Photo: *Dairy Engineering*

Rindless cheese ripened in "Cryovac" roll film. Note the absence of mould.

Photo by courtesy of Bladen Dairies Ltd.

Rindless cheeses in the ripening room. The square shape takes up much less space than the round.

Commercial Horticulture in Sardinia (Article on pp. 374–7)

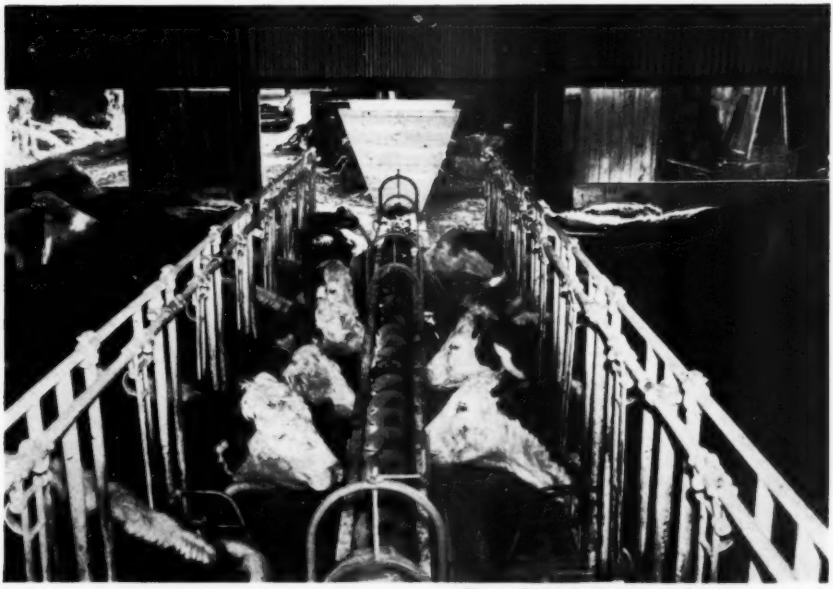
Ploughing in the huge glasshouses of the brothers d'Atri.

Photos: *Horticultural Photo Supply Service*

Irrigation between the double rows of runner beans is quite common.

Feeding Maize Silage (Article on pp. 352–6)

A tower silo unloader which will be used in the silo at Harper Adams Agricultural College during the winter of 1960–61.



Photos: *Wellington Journal and Shrewsbury News*

Hereford bullocks on the Harper Adams maize silage feeding trial, being fed from an auger feed.

management, and understand precisely the various work routines involved. The buildings should then be designed to serve those requirements. It is no small problem to decide whether to have full or part cover, manger, self or easy feeding, or a combination of both. There are also bed and breakfast and zero grazing units. Whatever the system chosen, the yard, milking parlour and all bulk storage should be planned as one unit of accommodation to ensure minimum capital cost and economic use of labour in handling cows, food, bedding and manure. Plan also for flexibility within the yard, and allow ample space for future expansion.

In the early years after the war it was common practice to keep cows in groups of 10–20 per yard and to straw the whole area, whether fully or partly covered, but progress in cow management, the need for more efficient utilization of labour and a shortage of straw have brought about considerable changes in overall design.

Cow numbers and space requirements

Some outstanding results, combining high yields with economic man-hours per unit of production, have been achieved by keeping cows in one group. It is quite common to find 80 cows all in one yard, and on occasions considerably higher numbers are kept. There may be a need to split a large herd into two groups, but further segregation complicates cow movement, increases labour and capital cost, and may give no better results.

Experience indicates, and the shortage of straw dictates, that there should be a bedded area for resting and concrete for exercise and feeding. The resting area should be divided off so that cows go there to lie down and not roam around, and there should be no feeding or watering on the bed. There are no hard and fast figures which can be rigidly applied; each case must be considered individually, because area per cow is governed by breed and the methods of management. Assuming cows are dehorned, the following figures, which include manger space, are based on specific forms of management and are a fairly reliable guide. Any attempt to reduce them will almost certainly result in badly soiled cows, injuries, high straw consumption and labour cost in cleaning up.

1. Yarded day and night and manger-fed for 4–6 months: 80–100 sq. feet per cow according to breed. Generally speaking 50 sq. feet per cow is considered adequate for the bedded area, but experience has shown that Friesian cows need about 60 sq. feet for comfortable resting and movement. For Jerseys the bedded area may be reduced to 45 sq. feet, with a minimum of 35 sq. feet of concrete.

2. Yarded at night only: 70–80 sq. feet per cow. Jerseys 60–70 sq. feet.

3. Fully self-fed or combined units: if silage is to be fed 24 hours a day for the full yarding period, a commencing area of 70–80 sq. feet may be satisfactory, with careful management in the first few weeks. A similar area will also be suitable where kale is strip grazed by day and silage fed at night. But if self-feeding of silage is to be restricted and other bulk fed in the yards, an additional area of concrete with mangers or containers must be provided, generally 20–25 sq. feet per cow.

4. Easy feed unit (floor space increasing as food is consumed): 70–80 sq. feet, including not less than 50 sq. feet of bedded area.

5. Zero grazing (winter and summer): 100–150 sq. feet.
6. Bed and breakfast: 90–100 sq. feet per cow (including silo floor).

There is a tendency to cut floor space to reduce building costs, often with disastrous results. What is the use of making a small initial capital saving if, in so doing, you create a perpetual charge for excessive labour in cleaning cows and buildings, and in providing increased quantities of straw? Reducing floor space by 10 sq. feet per cow may effect a capital saving of £4 an animal—£160 for a herd of 40 cows—but the decreased area would almost certainly mean an increase in straw at an annual charge of anything from £40 to £80, depending on the price per ton. In addition, labour costs will increase.

Bedded area

The bedded floor space per cow may vary according to circumstances. For instance, in a long, narrow building open along the front, where cows can walk in as though entering a row of stalls, 35–40 sq. feet may be sufficient. But the value of such a narrow shelter is open to question.

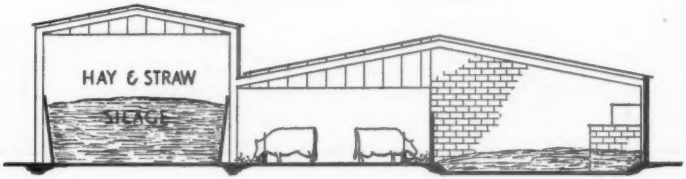
On a self-fed silage system, some cows are always at the silage face, therefore less space may be needed than for a manger-fed herd, where all the cows may lie down at the same time.

Regular routine attention is important. A well compacted depth of straw—a layer of bales, for example—is necessary to start the season. The bed should then be strawed and the concrete cleaned every day. Failure to do this will cause rapid deterioration of the dung pack. For a bedded area of 50–60 sq. feet per cow yarded day and night, straw consumption may amount to 3–4 cwt per cow per month, plus the initial filling of 4–5 cwt per cow. Sawdust has proved a satisfactory alternative and is cheaper, but supplies may be unreliable.

Feeding arrangements

To achieve flexibility and low capital cost, feeding arrangements are becoming simpler. Solidly constructed permanent mangers and feeding passages are in less demand. A feeding passage 9–10 feet wide to serve two rows of mangers may cost £12–£14 per pair of cows, and is only used for a few minutes each day. Why incur this extra cost when modern design can provide an efficient alternative? With a system of "tail to tail" feeding from two parallel rows of troughs, or "head to head" feeding from a wide central trough, a separate feeding passage or road is unnecessary. While food is being put out, the cows must be confined to their separate resting area: a study of Figs. 1 and 2 shows how simple it is to work the routine. Another advantage is that by the use of gates or spring-loaded electric wire, the concreted feeding area can also form all or part of the holding area for milking. Similarly, wires with simple operating arms fixed to the troughs can be used to keep cows away from them until feeding time.

If the whole area of a yard is strawed, permanently raised or adjustable troughs are essential to allow a 3- or 4-feet build-up of dung. The alternative, now common practice, is to provide a concrete feeding and exercise area quite separate from the bedding. The natural place for a cow to feed is at or



SECTION THROUGH SILAGE BARN AND COVERED YARD

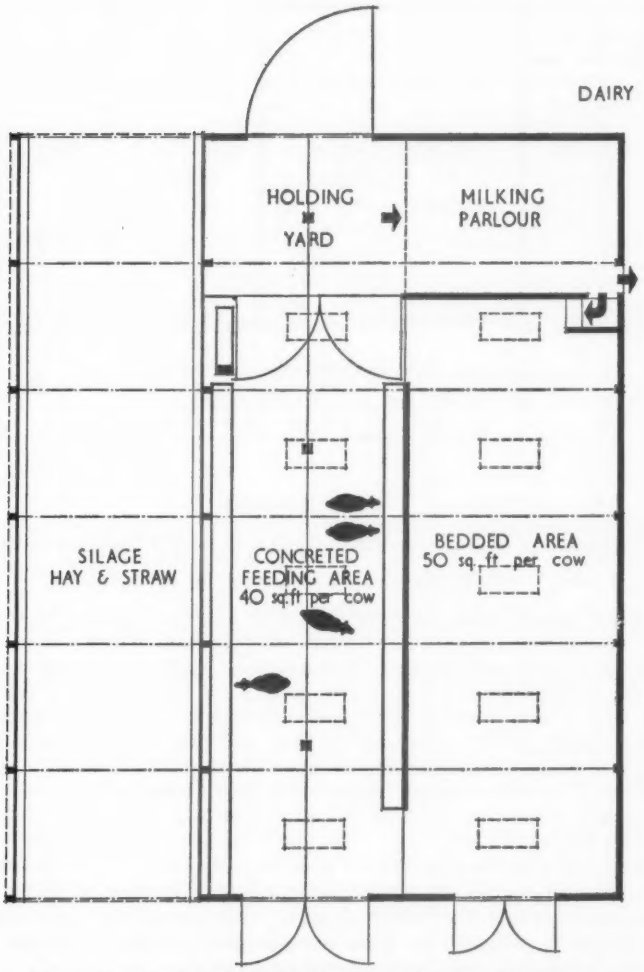


Fig. 1. A self-contained and flexible unit, with tail to tail feeding.

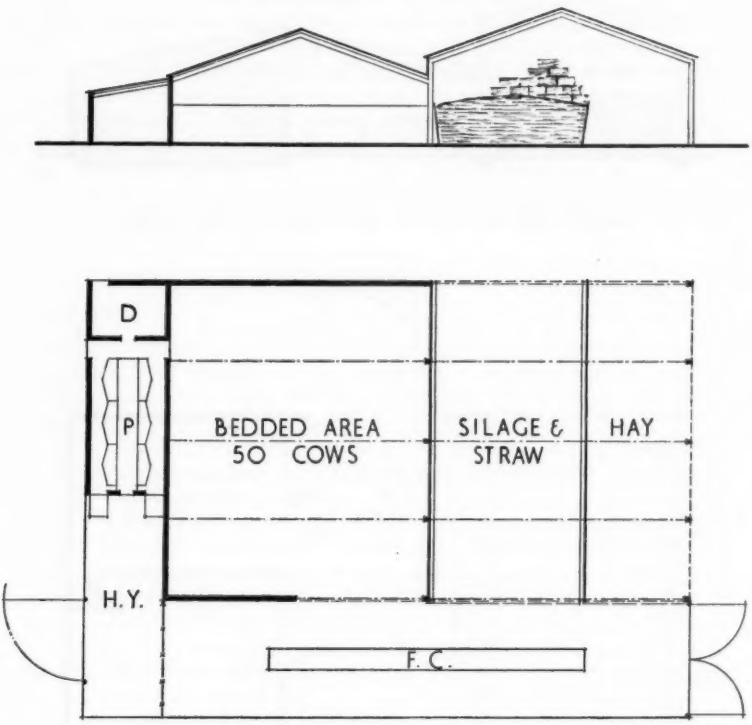


Fig. 2. Another self-contained unit, using bulk or self-feeding.

just above ground level, therefore it is quite easy to construct on the concrete a varied choice of simple troughs for bulk food. There is no need to build costly permanent mangers with sweeping profiles and small capacity. Use the concrete floor as a base, and erect a low wall or barrier front and back, with a width between of not less than 2½ feet; such a trough will hold adequate bulk, prevent waste and be easy to clean. Along the front, fix a horizontal adjustable rail to keep the cows' heads down. Provided a manger or container is well designed, hayracks are superfluous and only add to the cost. Yokes may be necessary if bulk feed is to be strictly rationed, or concentrates fed in the yards.

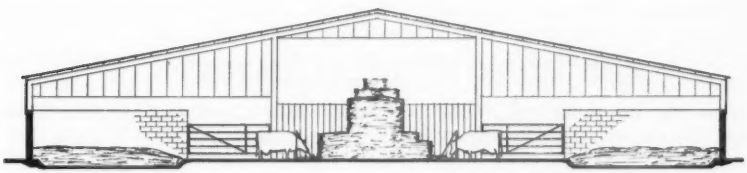
Substantial portable containers of good capacity have much to recommend them, especially as they can serve a dual purpose by forming perimeter fences or enclosing the side of a building or area. Feeding areas need daily cleaning, and should be designed to allow a mechanized scraper a straight drive through. Dead ends and turning should be avoided.

Full or part cover

Whether to have full or part cover is always difficult to decide. Full cover may cost about £16 a cow more than a partly covered unit with equal floor area and facilities. Apart from climatic considerations it has the advantage of better working facilities; cow and feed keep dry, there is no serious drainage problem, and the bedding keeps in better condition.

Whilst the partly covered unit involves less initial capital, it has certain disadvantages which may add to working costs. It presupposes an outdoor feeding system, and working conditions are less favourable. The disposal of slurry plus storm water presents a major problem to most farmers.

Generally, long, narrow open-fronted shelters are uneconomical because they do not provide a dry bed: at least one-quarter becomes wet, soggy and unsuitable for cows to lie on. Where such shelters already exist it is advisable to wall in part of the front, and restrict entrance to one or two places, depending on the size of the herd. As a rule the open side of a yard should face south to south east.



SECTION THROUGH BEDDED AND SELF-FEED SILAGE AREAS

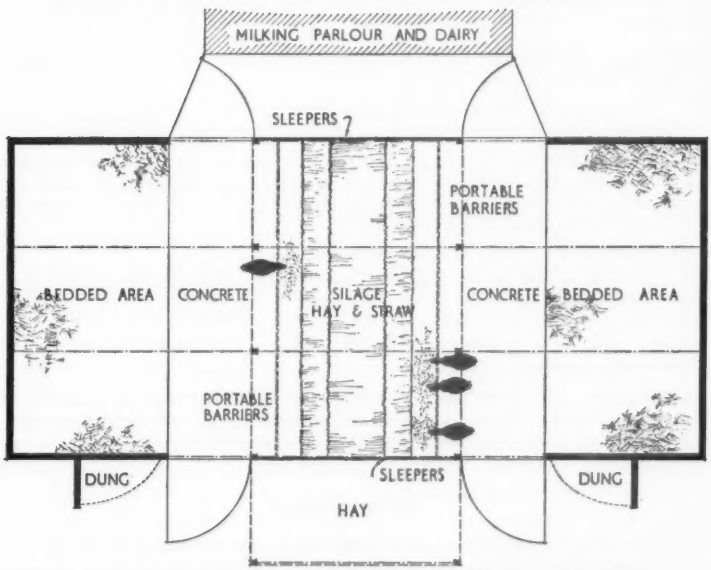


Fig. 3. An easy feed system. There are no permanent fittings within the building.

Ventilation

Yards should not be draughty, neither should they become hothouses. Temperatures of not more than 5–8°F above outside are desirable, to reduce humidity and keep bedding dry. Tightly enclosed buildings should be avoided. The extent of walling and cladding must be based on experience of local conditions. Fringed or perforated gable peaks are an advantage, to induce air movement.

The accommodation discussed can be provided by the use of prefabricated structures of many types and a variety of materials. Modern design provides frame-works with clear spans, free of tie beams or roof trusses which restrict headroom and add to the cost of maintenance.

THE MINISTRY'S PUBLICATIONS

Since the list published in the September 1960 number of AGRICULTURE (p. 307) the following publications have been issued.

MAJOR PUBLICATIONS

Copies are obtainable from Government Bookshops or through any bookseller at the price quoted.

Experimental Husbandry Farms and Experimental Horticulture Stations—Progress Report 1960. 4*s.* (by post 4*s.* 4*d.*)

A note on this Report appears on p. 348.

Dehydrated Vegetables for the Caterer (*Revised*) 1*s.* 6*d.* (by post 1*s.* 8*d.*)

Designed to help caterers make the best use of the range of dehydrated vegetables now available. Aspects discussed include the nutritive value of the different vegetables before and after dehydration, dehydration processes, buying, storing, preparing and serving.

Domestic Food Consumption and Expenditure 1958

Annual Report for the National Food Survey Committee (*New*) 10*s.* (by post 10*s.* 7*d.*)

LEAFLETS

ADVISORY LEAFLET

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No. 414. Eelworm on Strawberries (*Revised*)

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Cultivation of Oats in Wales (*Revised*)

Rindless Square Cheeses

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Clean, compact, easy to handle and usable to the last crumb, rindless square cheeses wrapped in film have advantages for the makers, shops and public.

SOME striking developments have occurred in the English cheesemaking industry during the last five years. The most noteworthy of these is undoubtedly the changeover from the traditional cylindrical to the hitherto unknown, square-shaped cheese. How has this come about, and what are the reasons for it? The present article describes some of the important development work and the reasons why that work was first undertaken.

It may not be generally realized why, in the past, cheese has had to be made in the traditional shape. Generally speaking, when the cheese is first pressed into shape from the original curd it contains much more moisture than the finished product. The corresponding loss in moisture occurs during ripening, and the greatest percentage loss is found near the surfaces of the cheese: hence the rind formation. In most cheese ripened in the traditional way there is a distinct moisture gradient from the inside to the outside. Indeed, in extreme cases the tough rind of the cheese can have a moisture content as low as 10 per cent, compared with an average moisture level inside the cheese of 36 to 38 per cent. As the moisture evaporates through the fast-forming rind, considerable stresses can be set up. These would be extremely severe at the corners of a square cheese and they have, in the past, been greatly minimized by the adoption of the true cylindrical shape characteristic of traditional cheese. It should be emphasized that these stresses can only be *minimized* in this way; they cannot always be eliminated.

Preventing dehydration troubles

In fact, cases are not unknown where the stresses arising from this dehydration have caused cracks in the rind. Such cracks allow rapid entry of air to the interior of the cheese, and any mould spores there can then grow extremely fast. Cheeses so affected are far from popular with cheesemakers; the fault has caused considerable financial losses over the years. Moreover, it has been customary to take very special precautions with the surfaces of the cheese, to give a smooth finish which would be less susceptible to cracks and fissure formation during the ripening processes. These measures have not been entirely successful, especially when air conditioning was introduced over the last few years to control atmospheric conditions inside the ripening rooms. For best ripening, a controlled temperature was found to be desirable. To achieve such a uniform condition inside the large factory cheese stores, conditioning plants which circulated the air were installed. Many of these plants caused considerable draughts inside the stores and these gave regions of locally accelerated drying of the cheese—much to its detriment. Once the

controlled temperatures were achieved it was quickly found that a control of the humidity in the room was also desirable. By maintaining the humidity at a fairly high level dehydration losses could be reduced considerably, but if the humidity was raised too high, heavy mould grew on the surfaces of the cheese. A compromise setting of the humidity between 85 and 90 per cent R.H.* led to a reduction in the moisture losses in the cheese due to evaporation; but the mould growth, though heavy, was tolerable.

Thus the round shape of cheese was undoubtedly originally chosen because of these dehydration difficulties. Improvements in recent years in the control of the conditions in the ripening rooms have only minimized them: the difficulties have not been entirely eliminated. It is not surprising, therefore, that once protective coatings became available which would eliminate dehydration during ripening, striking developments in the cheese industry became possible.

Qualities of a suitable wrapping: films

This more favourable position was reached with the advent, first, of specially blended waxes which could be applied as a uniform coating around the cheese and, secondly, with the new specially "tailored" films made from synthetic resins, etc., which could be fitted as a kind of continuous envelope surrounding the cheese.

Most coatings of these two types had not only a very low water vapour permeability (which prevents dehydration of the cheese "wrapped" in them) but they also possessed a very low oxygen permeability. An exception to this general rule is polythene film, which has a very low water vapour permeability but a comparatively high permeability to oxygen. As a matter of interest, this film is quite unsuitable for wrapping cheese, for reasons which will be elaborated later in this article.

When the development work now described was started some four or five years ago, the sceptics said most emphatically that it was doomed to failure because the films and coatings under study would not transmit oxygen. Most cheese experts at that time were convinced that "cheese must breathe" if successful ripening was to be achieved. Events have proved that this was an erroneous view. In fact, most cheese can ripen quite successfully with very little oxygen.

Very many trials have been carried out at Shinfield over the past five years, and the results of the work clearly show that cheeses which have previously been coated, or wrapped completely, in a suitable film can ripen satisfactorily. Such coatings and films must possess a low water vapour permeability—to prevent dehydration of the cheese—and a low oxygen permeability, to prevent the entry of air to the cheese, with subsequent mould growth. They must also be capable of being put on as a continuous coating to the cheese or, in the case of films, it must be possible to make a film wrap completely air-tight.

Cheeses produced in this way are found to develop no hard rind, hence

* Relative Humidity: the ratio between the amount of water vapour the air *does* contain and what it *can* contain at the same temperature. At any given temperature, the lower the R.H., the more quickly can evaporation take place.

the term "rindless cheese". They also show, when properly prepared, no surface mould growth. The whole of the cheese so produced is completely edible, and this is a particularly valuable feature for the retail grocer. All that he has to do is to remove the wrapping film or the coating (and some coatings are specially designed so that they will easily peel off) and the cheese is ready for cutting and retail sale. Rindless cheeses have many other important advantages, but it may be convenient first to discuss some of the coatings and films which have been found to be suitable for their production.

I have already written that polythene is far from suitable. It fails because of its high oxygen permeability, which allows oxygen freely to contact mould spores on the cheese surfaces. These spores then quickly produce an unsightly growth of mould beneath the film, and afterwards and in extreme cases more serious spoilage of the cheese can occur.

Coats of "paint"

Specially blended coatings containing the tougher microcrystalline waxes can be applied to cheese surfaces by dipping the cheese in a hot bath of the molten wax for a few seconds. The wax coatings so produced are not as perfect as the better types of film: they still allow some dehydration of the cheese, and unless great care is taken a moderate amount of mould can grow under the coating. But such a technique offers advantages over the film method for the smaller cheese producer, particularly the farmhouse cheesemaker, who does not wish to invest considerable capital in the plant required for handling films. For example, he can keep to the traditional shape of cheese, use his old original forming moulds, and the only new equipment he requires is an electrically heated bath for the melted wax. But because he has departed only slightly from traditional methods he has to watch and often "nurse" the cheese during the ripening processes. Moreover, his yield by weight of cheese could have been greater had he employed film wrapping techniques.

Paint-like coatings, based on synthetic resins, can also be used without investing in much new capital equipment. These paints, most of which are formulated from polyvinyl acetate, can be applied to the cheese surfaces by brushing or spraying, and once the dispersing medium has evaporated a tough skin is left adhering to the surfaces of the cheese. Such coverings have most of the disadvantages of the wax coatings; and some of the compositions take several hours to dry out enough for the cheese to be handled.

The wax and resin coatings do not support the surfaces of the cheese sufficiently, and it is necessary to apply them over the calico bandages in which the cheeses are first pressed and shaped. The subsequent removal of these bandages along with the coating can sometimes be a laborious process when the ripened cheese finally reaches the retailer, and has to be cleaned ready for sale.

Films now available commercially

The films which are satisfactory and are being used on an increasing scale will now be listed. First, there is "Cryovac", a copolymer material, which is

available in sheet form and as bags into which the whole cheese can be placed before the bag is sealed by a metal clip. It is usual to evacuate the bag and its contents to a high degree of vacuum before sealing. Such a sealed bag will hold its vacuum for many months: samples so treated at Shinfield have held it for over two years at normal cheese ripening temperatures.

Another film, made of cellulose lacquered or laminated to polythene, is also used. This is also supplied in the form of bags or pouches which can be used in a similar fashion to the "Cryovac" bags. They can be sealed by means of a heat-seal weld, and special machines are available for the purpose.

Cheeses of traditional shape can easily be ripened in these bags or pouches. It was quickly found that square cheeses could also be ripened satisfactorily in such wrappings, and very large quantities of these square cheeses (particularly Cheddar and Cheshire) have been manufactured by this method in this country during the last three or four years. No cracks develop in the outer surfaces of the cheese, for no dehydration takes place.

The square shape offers tremendous advantages. For example, such cheeses take up less storage and ripening space. In a recent test, a total of four tons of cheese, made up in 40 lb rectangular blocks, was ripened in a space 10 feet $\times 2\frac{1}{2}$ feet $\times 4$ feet. A similar quantity of traditionally shaped cheese would need at least four times this space—largely because the round cheeses have to be kept separate from each other; if their rinds touch there is serious danger of "rind rot" taking place. Moreover, such cheeses have to be turned frequently during ripening. For these and other reasons they have to be stacked individually on separate racks or solid trays. Square rindless cheeses, on the other hand, can be stacked one on top of the other in bulk quantities, and need not be disturbed or moved for any purpose during ripening.

Films in sheet form have also been used for wrapping these rectangular blocks. Typical films employed are waxed cellulose film, e.g., "Pukkafilm"; "Pliofilm" (of a special grade $40N_1$); and various types of copolymer film such as "Saran" and "Roll Cryovac". More recently, a special grade of nylon film ("Ralsin") has been tried, with most encouraging results. All these can be sealed by the application of heat and pressure, and special presses have been designed in which the film can be applied as a thin and continuous veneer-like coating to the cheese blocks. A new type of three piece block mould has also been designed in which the uncured cheese blocks can be prepared from the original curd. It is customary to strip off the cheese bandages in which the blocks were originally pressed before applying the film. These bandages can then be used for further pressings of cheese.

The method has been applied to most types of English cheese, particularly the hard-pressed varieties. The only cheese which has not been successfully ripened in this way is Stilton. This is not altogether surprising, since it is difficult to reconcile the requirements of the blue mould—which needs oxygen for its growth—and the elimination of oxygen, as specified for a true rindless cheese. This unsolved problem is receiving attention.

Rindless square cheeses sell faster

Market research has revealed that retail grocers prefer rindless cheese, particularly if it is square. Furthermore, the small retailer has shown a dis-

tinct preference for the 10 lb rectangular block, which can be as readily and successfully produced as the larger 40 lb block. The smaller blocks meet the average weekly turnover of many grocers more readily. And the larger supermarkets have found the 40 lb blocks ideal for the fast and often mechanized cutting-up processes used at their central packing depots. The cheese factories pioneered this major change in the ripening methods for English cheese; now the farmhouse cheesemaker is finding that his customers are demanding similar standards in farmhouse cheese. Already some of these makers have instituted a waxing process for their cheeses; others are exploring the film techniques. There can be little doubt that this change will gain impetus in the years immediately ahead.

The Egg Situation: Some Observations

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In these days of low egg prices producers must improve their efficiency, and more especially raise the rate of production of their flocks, to reduce their unit costs and maintain or increase their profits. Breeders must pay attention to egg size as well as productive capacity.

WHAT level of costs must egg-producers achieve to make reasonable profits, with price prospects as they are today? In this article I have assumed that this year producers will receive an average price of about 3*s*. 5½*d*. from the Egg Marketing Board, which is rather more than in 1959–60. Under the new guarantee arrangements they may get a little more this year than last, even with the reduced guarantee, provided that the Board's average selling price is no lower than last year; so far, it has been rather higher. It may be prudent to assume that, in future, the producer's price is at least as likely to fall a little below the present level as to rise appreciably above it.

Most poultry-keepers have relatively small flocks, of less than 400 layers; and most of them are also small general farmers, who regard poultry as a supplementary enterprise and do not actually incur cash expenses on labour used in this way.

Total costs per bird vary according to the system and quality of management, the breed of bird, and the size of flock. The larger flocks are likely to be managed by the better flock-masters, and will benefit from the economies derived from large-scale production. The cost of food and equipment is greater for birds kept in cages than for those on deep litter; smaller breeds eat less than larger ones; and, unless special care is taken, much food can be wasted. Naturally, every effort must be made to ensure that full use is made of all the available equipment and labour and that no food is wasted, to reduce the costs per bird or per flock to a minimum.

Costs and the rate of production

Moreover, the cost per dozen eggs produced depends also on the rate of flock production, which itself varies tremendously from farm to farm according to the breed and strain of bird and the standard of housing and management. The average cost of production per dozen eggs becomes less as the yield increases, because the fixed costs are then borne by a larger number of eggs. Even such costs as those of the production ration and labour vary very little with the rate of production under intensive systems. Table 1 shows the average costs per dozen eggs, at various rates of production, for a flock of 300–500 birds.

Table 1

Relationship between costs and rate of production

Annual production per bird (doz)	12	13	14	15	16
Food consumed per bird (lb)*	98·0	100·4	102·8	105·2	107·7
Food consumed per doz eggs (lb)	8·2	7·7	7·3	7·0	6·7
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Food cost per doz eggs†	2 4½	2 3	2 1½	2 0½	1 11½
Other costs‡ per bird	18 6	18 6	18 6	18 6	18 6
Other costs per doz eggs	1 6½	1 5	1 3¾	1 2¾	1 2
Total all costs per doz eggs	3 11	3 8	3 5¼	3 3¼	3 1½
Total costs (excl. labour) per doz eggs	3 3½	3 1	2 10¾	2 9½	2 7¾
Profit (over all costs) per bird§	−5 6	−2 8½	3½	2 9¾	5 4

Annual production per bird (doz)	17	18	19	20
Food consumed per bird (lb)*	110·2	112·7	115·2	117·7
Food consumed per doz eggs (lb)	6·5	6·3	6·1	5·9
	s. d.	*s. d.*	*s. d.*	*s. d.*
Food cost per doz eggs†	1 10¾	1 10	1 9¼	1 8¾
Other costs‡ per bird	18 6	18 6	18 6	18 6
Other costs per doz eggs	1 1	1 0¾	11¾	11
Total all costs per doz eggs	2 11¾	2 10¾	2 9	2 7¾
Total costs (excl. labour) per doz eggs	2 6½	2 5½	2 4½	2 3½
Profit (over all costs) per bird§	8 1¾	10 10½	13 5½	16 3

* Food consumption based on the estimated requirements of light × heavy crosses. The actual consumption is probably higher than this at the lower yields.

† Food at 3½*d.* per lb.

‡ These include depreciation of birds 8*s.* 0*d.*, labour 7*s.* 6*d.*, and depreciation on buildings and equipment 3*s.* 0*d.*

§ With eggs at 3*s.* 5½*d.* per dozen.

The last line but two in Table 1 gives the total costs at various rates of production, whilst in the last line but one the cost of labour has been excluded. Labour is as much an item of expense as any other to the specialist egg producer, and even to the mixed farmer employing it to care only or mainly for poultry; but to the specialist who cares for his flock himself or to the mixed farmer who uses only surplus labour, whether hired or family, it is not a cash expense which can legitimately be charged against poultry. In the latter case it should be charged wholly against the main enterprise(s) for whose care it is mainly intended.

The average yield per bird for the national flock is probably about 180 eggs, and at this rate of production the average cost per dozen should be

3*s*. 3¼*d*. If the average price received by producers is 3*s*. 5½*d*., a large number of them must make little or no profit, and even more may suffer losses. In flocks cared for by unpaid or surplus hired labour, however, the cost per dozen eggs at this rate of production is 2*s*. 9½*d*.; and the profit is as much as 8¼*d*. a dozen or 10*s*. 4*d*. per bird. Even so, since the standards of management and the costs vary enormously from farm to farm, there are many who must in future make very low profits and even incur losses unless they can improve their efficiency.

The important point illustrated by Table 1 is that as the yield per bird increases the cost per dozen eggs falls, and a larger profit per dozen is obtained from more eggs. With a yield of 15 dozen per bird, the average total cost per dozen eggs is 3*s*. 3¼*d*., so that, when the producer price is 3*s*. 5½*d*., the profit per bird is 2*s*. 9¾*d*.; but, for a yield of 20 dozen, the average total cost per dozen is 2*s*. 7¾*d*. and the profit per bird 16*s*. 3*d*. The corresponding profits for producers who have no labour bills to meet are 10*s*. 4*d*. and 23*s*. 9*d*.

Higher production rate economically essential

To achieve a satisfactory level of profit, therefore, most producers must substantially increase the rate of production of their flocks, as well as reducing their food, labour, and other costs per bird. With the average producer price at 3*s*. 5½*d*. and yield at 180 eggs, the average cost per dozen would have to be reduced by 5¾*d*. to 2*s*. 9½*d*. to obtain a profit over all costs of 10*s*. 0*d*. per bird. This would call for economies in the use of labour and equipment which, if they were to be achieved fully, would involve a considerable increase in size of flock. These economies apart, and without any change in flock size, the existing profit per bird could be increased to 10*s*. 0*d*. by raising the egg yield from 180 to 210, thereby reducing the cost per dozen to 2*s*. 10¾*d*.

Many strains of bird can already yield 210 eggs, and even more, annually; but to raise the national flock to this level of production will take seven or eight years. Whilst some increase in the national average yield can be achieved by improved management on many farms, the main increase must come from the breeding of higher-yielding strains of bird. This task is in the hands of specialist breeders, and it must take some time before marked improvements are achieved and adequate supplies of high-quality stock become available for general use.

In the meantime, egg producers should buy their replacements only from reliable and proven sources. They should not try to cut costs by feeding the birds less, for such a policy will probably reduce the rate of production. Any attempt to enlarge their profits by increasing the size of flocks will, at the present level of demand, only result in a larger surplus of eggs and reduced wholesale and producer prices—the total profit per flock being no higher, and possibly even lower, than before.

If a 500-bird flock can be increased to 600 birds, using the same buildings and very little additional equipment, the depreciation on buildings and equipment, the labour cost, and therefore the total cost, per bird will be lower. Such an increase is likely to lead to a reduction of about 2*d*. per bird on the depreciation, and the labour cost is likely to be about 6*d*. per bird

less, even if charged at overtime rates, making a total saving of 8*d*. This is only ½*d*. a dozen eggs, assuming that the yield per bird remains the same. The profit per bird will obviously be increased by 8*d*. to 3*s*. 5¾*d*., and the total profit on 600 birds will become about £104, or £34 more than on 500 birds.

Table 2

Annual costs and profits

	500 birds		600 birds	
	per bird	per flock	per bird	per flock
Yield of 15 dozen per bird:	*s. d.*	£	*s. d.*	£
Returns at 3*s*. 5½*d*. a dozen	51 10½	1,297	51 10½	1,556
Total costs	49 0¾	1,227	48 4¾	1,452
Profit	2 9¾	70	3 5¾	104
Yield of 15½ dozen per bird:				
Returns at 3*s*. 5½*d*. a dozen	53 6½	1,338		
Total costs	49 4½	1,234		
Profit	4 2	104		

If this total profit of £104 is to be provided by only 500 birds, then the profit per head must be increased by £34 ÷ 500 = 1*s*. 4½*d*., which represents an additional yield of 6 eggs per bird. It is surprising that such a small increase in the current rate of production can have the same beneficial effect on profit as raising the number of layers by 20 per cent. (Of course, the smaller the flock, the greater the percentage increase in its size required to effect the same increase in profit as that resulting from a certain improvement in egg-yield.) A policy aimed at improving yields per bird will obviously increase the total output far less than one involving an increase in numbers of layers; it is far less likely to bring about a surplus of eggs and a slump in prices, and it places producers in a stronger position to meet price reductions when they come.

Better layers wanted

The demand for eggs is relatively inelastic, and increases in their consumption, despite rising incomes and standards of living, are likely to be small in the near future. An average annual increase of 2½ per cent, or 5 or 6 eggs per person, is the most that can be expected. Improvement in production rates may well average 4 eggs per bird so that, provided that the size of the national laying flock remains fairly constant, the surplus in egg supplies which has developed in recent years could, if conditions were favourable, be removed fairly quickly. The policy which egg producers should adopt is probably one of preserving rather than increasing the size of their laying flocks, avoiding surpluses of eggs, and utilizing the best laying strains to maintain or increase profits by higher production at a lower cost per dozen.

Breeders of commercial laying stock have, therefore, a very important part to play in the future prosperity of the egg-production industry. They must breed not only for high production and a low food-conversion rate but also for stamina, to maintain as low a death-rate as possible; and, since there is a

tendency for egg size to decline with higher rates of production, they must select layers of larger eggs.

If these conditions are fulfilled, there is no reason why egg producers generally need worry about the future of their industry, provided of course that they practise a reasonably high standard of management. Large-scale producers, however, will be tempted to respond to a price reduction by increasing the size of their flocks, thus utilizing more fully both the considerable sums of capital they have invested in equipment and their heavy labour bills, and thereby reducing their costs and maintaining their profits. These large-scale producers are relatively few in number, but they control a substantial proportion of the national laying flock; and the policies they adopt can have repercussions on the great majority of poultry-keepers. If they decide to increase the size of their flocks they can easily bring about a surplus of eggs on the market, not only to their own detriment but to that of the smaller producers as well. Although they themselves, and the small producers who do not incur cash expenses on labour, can cope with a further price reduction, many medium-scale producers will find the going very hard and may be forced out of business.

With the current reductions in the prices of culled layers, and in these days of higher bird depreciation and declining egg prices, the benefits of drastic culling are far less obvious than they used to be. Provided that the doubtful layers have laid, or are expected to lay, enough eggs to compensate (and more) for the food each has eaten or will eat in a certain time, then they must obviously be contributing something towards such overhead costs as labour and their own depreciation. If they are culled too soon, a large share of their depreciation will have to be borne by other layers or by the replacement pullets—which already have to cover their own share of costs.

Popularity of hybrids increasing

Because large eggs attract higher prices, it is worth considering whether first-year layers are still more profitable than second-year, and hybrids more profitable than pure breeds or crosses of pure breeds. If we have a February-hatched light × heavy flock, laying an average of 17 dozen eggs per bird during the first year and 12¾ dozen (25 per cent less) during the second, the relative numbers and values of the different grades of eggs will be roughly as follows:

	Large	*Standard*	*Medium*	*Small and seconds*	*Total*
First-year light × heavy breed					
No. of eggs	84	80	20	20	204
Per cent	41	39	10	10	100
Price per dozen	3*s.* 7½*d.*	3*s.* 3*d.*	2*s.* 6*d*	1*s.* 10*d.*	Average 3*s.* 2½*d.*
Total value	25*s.* 4*d.*	4*s.* 2*d.*		3*s.* 1*d.*	54*s.* 3*d.*
Second-year light × heavy breed					
No. of eggs	107	31	8	7	153
Per cent	70	20	5	5	100
Price per dozen	3*s.* 8½*d.*	3*s.* 3*d.*	2*s.* 6*d.*	1*s.* 10*d.*	Average 3*s.* 5½*d.*
Total value	33*s.* 1*d.*	8*s.* 5*d.*	1*s.* 8*d.*	1*s.* 1*d.*	44*s.* 3*d.*

In this case total receipts are about 10*s.* more for first- than for second-year layers. On the assumption that the food cost per bird is approximately the same in both years, and that the depreciation per bird, which is incurred only during the first year, is 8*s.* 6*d.*, first-year layers are clearly the more profitable. In a well-managed flock one would not expect the death-rate to differ much between first- and second-year birds.

The discrepancy in receipts between first- and second-year layers is even greater with hybrids than with pure breeds and their crosses, as the following figures illustrate:

First-year hybrids	*Large*	*Standard*	*Medium*	*Small and seconds*	*Total*
No. of eggs	67	114	36	21	228
Per cent	25	50	16	9	100
Price per dozen	3*s.* 6*d.*	3*s.* 3*d.*	2*s.* 6*d.*	1*s.* 10*d.*	Average 3*s.* 2½*d.*
Total value	19*s.* 9*d.*	30*s.* 10*d.*	7*s.* 6*d.*	2*s.* 11*d.*	61*s.* 0*d.*
Second-year hybrids					
No. of eggs	103	52	8	8	171
Per cent	60	30	5	5	100
Price per dozen	3*s.* 8*d.*	3*s.* 3*d.*	2*s.* 6*d.*	1*s.* 10*d.*	Average 3*s.* 4½*d.*
Total value	31*s.* 6*d.*	13*s.* 6*d.*	1*s.* 8*d.*	1*s.* 3*d.*	47*s.* 11*d.*

In estimating the prices for large eggs, I have considered the numbers likely to be produced monthly by each type of bird. With first-year layers, relatively few of the large eggs produced would be laid during the high-priced period from August to January. Second-year layers would be in moult during July–September, but they would lay a fairly consistent number of large eggs each week from October onwards and would catch the highest-priced period—October, November and early December. For these reasons the average price for large eggs is even higher for second-year than for first-year layers. It has been assumed that the average price for standard, medium and small eggs will not differ much between the first and second laying periods.

The best practice for those who are accustomed to keeping laying stock for the second year is to buy their day-old chicks at the beginning of December and hold back production until the beginning of May. This can be achieved by feeding good-quality oats and insoluble grit from about eight weeks to laying, if the birds are reared on good grass range, or by controlled lighting if they are reared intensively. The pullets will then lay a relatively higher proportion of large eggs at the time of the price increases in July and August. They should be force-moulted early in May of the following year, to bring them into full production once again in time to take advantage of the high prices; and, if disposed of at Christmas, they will probably realize a much higher price than if kept on to the late spring. All this calls, of course, for flock-masters who understand the procedure of force-moulting, and for a high level of management thereafter.

The above figures also suggest that hybrids are more profitable than pure breeds and their crosses. Not only is the return per bird higher, because the hybrid lays more eggs, but food consumption and cost are appreciably lower. Of course not all hybrids perform equally well; but their food consumption per dozen eggs is reported to be at least 1 lb less than that of other birds.

Thus their food cost per bird is at least 5*s*. 6*d*. less than that for pure breeds and their crosses. On the other hand, the adult hybrids weigh about 2 lb carcass weight less so that, since their cost is not much smaller at point of lay, the depreciation per bird is at least 2*s*. 6*d*. more for them than for pure breeds and crosses. On balance the margin per bird for hybrids will exceed that for other birds by 6*s*. 9*d*. + 5*s*. 6*d*. − 2*s*. 6*d*. = 9*s*. 9*d*.

At present, hybrids probably account for between 25 and 30 per cent of the national laying flock. They are likely to become even more popular, and will probably bring about an overabundance of small eggs and a shortage of large ones. This will result in an even wider price differential between large and small eggs, and will emphasize once again the fact that breeders must pay attention to egg size as well as productive capacity when selecting their breeding stock.

Nitrogenous Liquor as a Fertilizer

AN interesting booklet entitled *Nitrogenous Liquor as a Fertilizer* has just been published by the Nitrogenous Liquor Committee of the National Association of Agricultural Contractors. This gas liquor, generally known in the gas industry as "ammoniacal liquor", is being used increasingly where a nitrogenous fertilizer is required. The increase in sales from over 5m. gallons in 1955 to more than 61m. in 1959 speaks for itself. It is in effect the same material which farmers have been using for years in the form known as sulphate of ammonia.

The handbook describes briefly how the liquor is produced and gives general advice on its use on grassland, kale and corn, based on the normal rates of sulphate of ammonia application. The results of field trials are also given. The point is made that nitrogenous liquor has, apart from its main use as a fertilizer, a certain value as a weed-killer and pesticide, thus providing further benefit at no extra cost.

On the question of price, perhaps the most important consideration of all for most farmers, it is claimed that the in-the-ground cost of the liquor compares most favourably with that of the solid forms of nitrogen in the bag.

This very informative little publication may be obtained from the National Association of Agricultural Contractors, 52 Bedford Row, London, W.C.1, price 1*s*.

Commercial Horticulture in Sardinia

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Director of the International Horticultural Advisory Bureau, Arkley, Herts

Horticulture has made great progress in Sardinia over the last two or three years, under the guidance of a skilled and numerous advisory staff.

SARDINIA is an island of contrasts: there is the obviously very new, and the equally interesting very old. It is, in fact, what you would expect from an island which has "giant's tombs" hidden away—and which was subjugated in the first Punic war. She had to fight against the Moors; fell to the Spanish conquest in the fourteenth century; was Austrian in 1713 and became Italian in 1720. Sardinians have always been proud and independent in their attitude, despite all they have been through down the centuries.

The island, 9,300 sq. miles in extent, and 7½ miles south of Corsica, is divided into three provinces, Cagliari, Nuoro and Sassari, the town of the same name acting as capital of each province. Nuoro is very mountainous indeed, and grows little of commercial horticultural interest. Sassari has a very productive plain north of Alghero, but the best province of all from the grower's point of view is Cagliari, because it is the most southerly and has the best soil, while the temperature on the whole is equable.

There are still many small market gardeners in Sardinia with only two or three acres apiece, and many of these are old fashioned in their ideas, but there are also growers with large acreages, the most modern equipment and a knowledge of manuring, pest and disease control which shows in the magnificent crops they grow. There has been tremendous development in the last two or three years and this is largely due to the drive of the Minister of Agriculture, the Hon. G. Caddedu. Signor Caddedu kindly received me when I planned to visit Sardinia, answered my questions and provided transport. He was courteous and helpful.

The horticultural advisory staff on the island is large and effective. There is a Director of Agriculture in each province, and a staff of twenty-five assistants in all—for an area about as big as Norfolk and Suffolk put together. This staff not only does the normal work of our N.A.A.S. but also teaches at the local horticultural schools for young farmers and labourers. I saw such a school on my way to the island of San Pietro, just off the south-western coast of Sardinia.

The main agricultural college, at Cagliari, takes forty students a year for a course lasting four years. The student pays 13,000 liras (about £7 10*s*.) a year for tuition, but has in addition to buy his own books. I was told that sons of large families did not have to pay any fees at all! After all the Region spends forty per cent of its annual budget on agriculture and forestry.

The climate is mild all the year round—the sunny, hot period being from March to November; December, January and February may have occasional wet days. The main roads are very good, and buses seem to go everywhere. Side roads to the towns are generally appalling, but the Government is giving ample grants at the present time for this work to be done. I saw much of it in progress.

Windbreaks are important

Hedges are tremendously important, as winds can be quite a nuisance. The old hedge was always of prickly pear, which certainly does form a magnificent, impenetrable boundary, and bears fruit in the summer. Moreover it seldom has to be cut. The Government are recommending the planting of the evergreen *Cupressus sempervirens horizontalis* as a windbreak, and you see it everywhere dividing the fields. It is tall, free from pests, and takes up little room. Planted two feet apart, it is fed and watered like other crops until it gets a good hold.

The population of Sardinia is only 1,402,000, and it is therefore claimed to be the least densely populated area in Europe. There is work for most, though recently the mines have not been paying very well and some unemployment was inevitable. Young labouring men are being trained to do horticultural work, at a starting pay of about 10*s*. a day. After a few years, when they are trained and are over 21, the pay rises to roughly £4 or £5 a week. The men and women seem hard workers; they are most pleasant to talk to, and full of fun.

Sardinia faces problems much like our own. Sicily, for instance, can grow outdoor tomatoes earlier than Sardinia, and has lately been exporting a large tonnage—with the result that the price has fallen. And Sicilian labourers are paid far less than the Sardinians. Both islands export to Italy, of course.

Though the water and irrigation problems on the island are being solved quickly, the main marketing difficulty appears to be transport to the mainland. Horticultural products, being perishable, must be moved quickly: and the provision of refrigerated trucks would make it possible for fruit and vegetables to be loaded in Sardinia and unloaded in any European market without deterioration.

Modern glasshouses

Among the largest and best growers on the island are Fratelli Attilio and Mario d'Atri at Quartucciu. These two brothers started up years ago, and since the war their work has developed by leaps and bounds. They have built enormous aluminium glasshouses covering 3 hectares in all. These are rather like our biggest British carnation houses, and have automatic ventilation and automatic electric air heating. The ventilators are unique: they pivot on a centre and can revolve completely, and are used to divert winds *into* the houses to keep the plants cool, and not to let the hot air out. The heater is only necessary for the three so-called cold months.

One brother is responsible for the outside crops, and the other for those under glass. I was amazed to see Majestic potatoes, cropping at 40,000 kilos per hectare, being harvested on 6th June. Women were digging them up, and four men were pulling truck loads down to the packing shed, where the potatoes were washed in tanks of water before going to market. Another excellent crop I saw out of doors was the globe artichoke, raised from suckers planted out one foot apart. In the nursery beds the brothers select the plants with the plain leaves and reject those with heavily serrated ones. The plain leaf types, they say, crop more heavily.

Under glass they like to get the tomatoes out by early June, and then plant fennel, which, they claim, is a good preparatory and cleaning crop for the

tomatoes of next year. There is nothing like it to improve the soil. The crop is also grown for its bulbous base, which is cooked and served as a vegetable.

All the land is given a dressing of dung inside and out, which costs only 1*s.* 6*d.* or so for a cart-load!

Other market gardeners are starting to grow crops under glass, using greenhouses like those of the d'Atri brothers. I saw two quite big installations at Pula, one owned by Signor Guiseppe Orbeno, and the other by three partners who sell under the name of Azienda Bachisceddu, the name of the farm. The idea is to get tomatoes to Italy early, when the price is 9*s.* a kilo, for when I was there in June the price had gone down to about 1*s.* 8*d.* a kilo.

It is wonderful to see the tremendously heavy crop of Washington navel oranges or Burbank plums, and of Passe Crasane and Beurré Clairgeau pears. The latter are grown on the espalier system, and most of the pruning is done by the circling method. Signor Lioni Lauzo showed me proudly his six acre fruit farm, and his motor knapsack sprayer, which can easily be carried on the back and has a 1½ h.p. engine. It holds ten litres of spray, and seemed very effective indeed. The strawberries on his farm, by the way, were being mulched with black polythene.

Donna Maria Saggiente's 400 hectare fruit farm at Capoterra is particularly well run. For example, Donna Maria has built a huge dam which is kept filled with water from the mountain. I was shown table grapes, seven-year-old peaches, and eight-year-old citrus fruits. Her tangerines are planted 22 feet square, and the Golden Jubilee peaches 20 feet square. These peaches were selling at about 3*s.* 3*d.* per kilo.

Smaller holdings

As a contrast, Signor Sylvio Mereu owns only four acres, which he inherited from his father, plus a number of other fields, which he has bought and which he cultivates intensively. He uses farmyard manure, plus superphosphate and Nitro-Chalk, but not potash, because the soil is very rich in this element. He is a very go-ahead man, and grows the new Moretinni peaches, a huge flat orange called Biondo, which this year (its tenth) is producing 60 kilos of fruit per tree. The planting is done at 20 feet by 15 feet.

I saw too the cauliflowers, onions, beans, artichokes, and carrots which he sends to market in large baskets. Signor Mereu has taken the trouble to dig wells by hand all over his land, and told me that he usually found water at forty-five feet, and sometimes at only fifteen.

I was also able to see large numbers of the smaller market gardeners, who are growing Zucchini squashes as well as tomatoes in the open, without doing any dis-shooting at all, and in some cases growing onions under trees because of the shade. Antonio Picciau of Ponti Becciu was one of these, and his grumble was that he had to rely on merchants calling to collect his vegetables to sell them in the market, and eventually returning him the money, less 10 per cent. These smaller market gardeners with two acres or so each complained to me that they were not doing too well.

One of the best vine growers in Sardinia is Signor Ambroggio Pintus-Argiopas, of Tanca Sa Turri. He was once a farm labourer, but applied himself to learning vine growing and now has 65 hectares of his own, on which he employs some thirty men. He grows Nuragus, a white wine grape,

and Monica and Bovali, which are red wine grapes, the former sweet and the latter not. His pruning is done on the Guyot method. He takes great advantage of the island's advisory services and has built a refrigerator which holds some 20,000 kilos. On one occasion, he imported grapes from Spain, put them in his refrigerated store, and sold them with very good profit in December and January.

Signor Joseph Pisu of Corogo proved to be a good vegetable grower in the open. He had some excellent potatoes on his fifteen acre holding when I was there. The first lot were planted in January for harvesting in May, and the second were ready to plant in September, for digging up in December. He told me that he bought new seed each year from Denmark.

It was very kind of Signor Doctor Cristoforo Onano, the Provincial Horticultural Inspector, to go round with me to explain the horticultural details so clearly. I am especially grateful to him, but I also offer my thanks to Count Zoppi, the Italian Ambassador in London; to Dr. Giorgio Fois, the I.C.E. representative in London, who helped me and made the visit possible; to Mr. J. H. Wardel-Smith, the British Commercial Counsellor in Rome, who very kindly gave me introductions, and to Dr. Guiseppe Faggioli, the Director of the E.P.T., who often very generously provided me with an interpreter.

Farming Cameo: Series 2

30. Crowland District

H. MacKenzie, B.Sc.
District Advisory Officer

THE Crowland district lies at the extreme southern boundary of "famous Lincolnshire", in that plain of rich alluvial arable land known as the Fens. As the county folk-song suggests, Lincolnshire is famous for many things—for churches, colourful skyscapes, and poachers, but most of all for agriculture. Within recent years its horticulture has brought it more fame than it ever dreamt of, for its bulb industry is known the world over and attracts tens of thousands of visitors every year.

"They have a beauty of their own . . . a beauty as of the sea, of boundless expanse and freedom. Overhead the arch of heaven spreads more ample than elsewhere as over the open sea, and that vastness gave and still gives such cloudbanks, such sunrises, such sunsets, as can be seen nowhere else within these isles." That was Charles Kingsley's description of the Fens. Topographically these Fens are one vast plain which to the traveller may appear uniformly flat and monotonous, but which to the true Fenman is as diversified in character as any part of Britain. The so-called "hills" are a slight misnomer; for example the village called Gedney Hill has an elevation of 13 feet above Ordnance Datum.

Crowland dates from the year 699, when a young Norfolk nobleman, tired of luxury and riotous living, rowed his boat to rest on a patch of dry ground in the midst of a swamp. He was a Christian convert in search of solitude and a life of devotion to religion. After his death in the year 714, Crowland Abbey was founded in his memory by the King of Mercia, and still stands, a mere shadow of its former glory. It was "dissolved" in the reign of Henry VIII, was occupied by the Royalists during the Civil War, bombarded by Cromwell, and remains today partly as a historical ruin and partly as a parish church.

The Romans drained much of the Fens, but after their departure the works decayed, and by the end of the eighth century had reverted to a boggy swamp. The work of reclamation was taken up again by monasteries like Crowland Abbey, but only on a very small scale. Throughout the centuries drainage has been the keynote of all progress, until today the whole area is covered by a network of catchment and internal drainage boards. The River Welland, which passes by Crowland, rises in the hills of Leicestershire and discharges into the Wash just south of Boston. As a result of recent drainage improvements, the artificial flood basins known as the Crowland and Cowbit Washes are being ploughed up. We are witnessing the Fenman's last victorious battle against his old enemy, water.

The Crowland district has within its boundaries almost all the variations of soil and farming to be found within the Fens. The soil can be classified into three types: silts, skirts, and peats. The silts and peats are self-explanatory, but the term "skirt" is not so widely understood. The skirt soils occur where the silts in the north meet the peats in the south, and they are sometimes, but not always, richer than either silt or peat.

The peats are generally very acid, and suffer from a condition colloquially known as "drumminess"—a complex physical and chemical malady with a characteristic irreversible dessication. Sludge lime from the sugar factories spread at the rate of sixty tons per acre has given wonderful results on this soil.

Farming in the area is all arable, with the emphasis on potatoes, sugar beet, peas and wheat. It is a land of great contrasts in mechanization. The smallholder exists, his only equipment a hoe and a bicycle, side by side with the highly-equipped 2,000 acre estate with its "radio-telephony" and fleet of combine harvesters. The small family farm generally consists of scattered fragments of land picked up at random, and that is why a cycle is such an important article of equipment.

Livestock are kept less for their direct monetary reward than for the muck, which is so beneficial, particularly to the silts. Naturally the Lincoln Red takes pride of place, although there is an increase in early weaning of the Hereford Friesian cross. Pigs and poultry are usually confined to the small family farm, and even then in very limited numbers.

The price of land is very high. Seldom can one find anything changing hands at less than £100 an acre, and generally it is £200 or more. It is interesting to note that when Napoleon was threatening England 150 years ago, land in this district fetched as high a price as it does today. When we consider the devalued state of our currency, it looks as if there is scope for a further increase in land values.

There are many technical problems associated with farming in this area.

Potato root eelworm is widespread, but the other eelworms of peas, sugar beet and cereals are not endemic. Wheat bulb fly, pea moth and slugs are a few of the pests which make life interesting, whilst there are a whole host of pathological diseases of farm crops which appear year after year. Potato yields are definitely on the decline, for reasons which are not easy to assess but are no doubt linked with depleted organic matter following upon 100 years of intense arable farming. It is not easy to build up organic matter, but very easy to reduce its level in the soil.

A characteristic of the district is the large number of excellent public roads which form a very close network over the whole area. Every single holding seems to have a public road to its front door. The railway transport system is also first class, and is one of the main reasons why the Fens developed rapidly as a potato growing area—produce quickly reached the industrial areas in an age before lorry transport had developed.

Regarding leisure activities, skating is a great winter sport which is free to all when the inland washes and dykes freeze over. There are few areas in Britain where such wide expanses of safe skating are so accessible to the general public. Rod fishing is excellent on most of the waterways, and many coachloads of people travel hundreds of miles, winter and summer, to sit on the river banks and bask in the beauty of the Fens.

★ NEXT MONTH ★

Some articles of outstanding interest

LUCERNE AS A GRAZING CROP *by F. E. Alder and D. J. Minson*

SOIL-BORNE VIRUSES *by F. C. Bawden*

FARMER-CONSUMER COMMITTEES *by A. W. Galilee*

ABBOTS RIPTON ESTATE *by C. W. Rowell*

THE FARMERS' CLUB

Particulars of some Forthcoming Meetings

12th October 1960. *Pigs for Modern Markets.* Lord Trenchard.

9th 9th November 1960. *The Future of the Poultry Industry.* Cyril Thornber, Esq.

14th December 1960. *The Importance of the Time Factor in Grazing.* Monsieur Andre Voisin.

11th January 1961. *Prospects for Crop Improvement through New Varieties and Better Seeds.* F. R. Horne, Esq.

These meetings will take place at the Royal Commonwealth Craven Street entrance, at 2.15 p.m.

In Brief

LIVER FLUKE PROSPECTS FOR THE WINTER

The weather over much of England and Wales during April, May and June was very dry, giving promise of another fluke-free year. Since July, however, there has been a marked change in the weather, and a continuance of this wet weather during September and October is likely to produce some disease this winter. Fortunately, the onset of conditions favourable for the development of the fluke has come too late to give rise to severe outbreaks of disease such as were experienced in the winter of 1958–59. The indications are that the season will be an average one, with stock in flukey areas acquiring a little infection. Occasional losses in sheep can be expected on farms where the disease is known to be a problem. Losses may be slightly heavier in flukey areas in south and mid Wales and in midland counties east of the Bristol Channel, because conditions here have been rather more favourable for the development of the fluke.

In these areas, the fluke infection is expected to pass from the snail to the herbage in the last fortnight of September; in other areas infection of the herbage is not likely to occur until October. Flukey fields should not be grazed after these times, and stock should be kept out of such fields during November and December, also in January where this is possible.

It is well known that treatment of sheep with the standard dose of either carbon tetrachloride or hexachloroethane does not kill flukes which have been living in such sheep for less than twelve weeks.

Since infection of the herbage this year is unlikely to occur before September, farmers are advised to dose their sheep in December and in January where the onset of the lambing season makes this possible. Dosing during these months will greatly benefit all stock.

Replacement ewes bought during autumn whose history is not known should be dosed as soon as possible, and cattle at risk in late autumn and winter will benefit from treatment with hexachloroethane in January.

More black disease is expected this year than last, and ewes on farms where the disease has occurred should be vaccinated during autumn to prevent any recurrence which may arise even under conditions of very low fluke infestation.

For further advice farmers should consult their veterinary surgeon.

CHAROLLAIS CATTLE

Lord Terrington's Committee on the Proposed Experimental Importation of Charollais Cattle, whose report* was published last month, considers that Charollais cattle may possess desirable characteristics when used for cross-breeding for beef production in dairy herds. It found that comprehensive veterinary safeguards are practicable, and has concluded that there is a balance of advantage in conducting a trial of Charollais bulls for cross-breeding for beef with dairy cows and heifers.

The Committee examined the risk of damage to the export trade in livestock. It found that there would be no technical justification for a change in the requirements of importing countries if Charollais bulls were introduced under the proposed conditions. Conflicting evidence was received about the risk of calving difficulty, and the Committee thinks that a trial is necessary to determine whether Charollais bulls would be suitable for crossing with dairy cows in Britain. Simi-

* Cmnd. No. 1140. Obtainable from H.M.S.O. price 4*s.* (by *post* 4*s.* 4*d.*)

larly it is not possible to forecast whether meat from the Charollais × Ayrshire will meet the needs of butchers and consumers.

The trial recommended by the Committee would consist of the experimental use of Charollais for cross-breeding with dairy cows in commercial herds, where records of the characteristics of the crossbred cattle would be kept. In addition, a small progeny test of Charollais × Ayrshire cattle conducted with other tests of crossbred cattle, or carried out separately, would provide for the determination of the food conversion rate of the crossbred animals.

The report includes a review of the developments in the industry that have led to the proposal to conduct a trial of Charollais bulls for crossbreeding with certain types of dairy cows, particularly Ayrshires, to give calves suitable for rearing for beef. It also includes a summary of the results of experiments conducted by the Ministry since 1950 to compare various pure breeds and crosses out of dairy cows for the production of beef.

The report has been presented to the Minister and the Secretary of State for Scotland and is now being considered by them.

C.L.A. FARM BUILDINGS COMPETITION

A Farm Buildings competition, taking as its subject a parlour milking system in England or Wales, constructed or substantially modified since May 1945, and in use by the end of this year, is announced by the Country Landowners' Association. "System" in this context is not intended to apply to the arrangement of stalls in the parlour—e.g., tandem, herringbone, etc.; it covers the milking parlour and dairy, arrangements for the collection and dispersal of cows, and for the disposal of milk and muck. Judging will be based on general practicability, layout, value for money, efficiency, and appearance. There is a first prize of £150, a second prize of £75, a third of £50, and five prizes of £5, with a £25 prize for the best entry submited by a C.L.A. member.

The closing date for the competition is December 30th, 1960, and the results will be announced by May 1st 1961.

Entries may be made by the designer, owner, or occupier of the buildings concerned. Full particulars and entry forms are available from the Country Landowners' Association, 24 St. James's Street, London, S.W.1.

THE GLASSHOUSE CROPS RESEARCH INSTITUTE, RUSTINGTON, SUSSEX

Sir William K. Slater, K.B.E., D.Sc., F.R.I.C., F.R.S., has been appointed Chairman of the Governing Body of the Glasshouse Crops Research Institute in succession to Mr. T. Ainslie Robertson.

Sir William, the Secretary of the Agricultural Research Council from May 1949 until June of this year, will assume office on the 1st October on the retirement of Mr. Ainslie Robertson, who has been Chairman of the Governing Body since 1953.

NEW FARM DIRECTORS

Three of the Ministry's experimental husbandry farms have recently had, or will shortly have, a new Farm Director.

Mr. R. W. Shepherd, M.A., Dip.Agric.(Cantab.), was appointed Director of High Mowthorpe E.H.F., in succession to Mr. R. E. Mackenzie, who has resigned, on 1st September: and Mr. F. E. Shotton, M.A., Dip.Agric.(Cantab.), will take over Terrington and Kirton when Mr. A. C. Owens, M.A., Dip.Agric., resigns on 1st November.

Book Reviews

Pig Keeping. W. D. PECK. Faber and Faber. 25*s*.

Here is an excellent book which will be of interest and value to the vast majority of pig keepers. It may not go into sufficient detail for the specialist, and possibly assumes too much knowledge for the complete beginner, but the basic information, thoughtful reasoning, and sound commonsense will be appreciated by all.

Mr. Peck obviously has a profound knowledge, based on a vast amount of experience, of all aspects of pig husbandry. As an adviser he has had the advantage of participating in other people's experience and coping with a wide range of real problems. This, no doubt is partly responsible for the valuable way in which the book comes to grips with the everyday difficulties of practical pig keeping. Though he has avoided partiality and misleading enthusiasm for particular systems, lines of policy or fashions in pig keeping, and certainly is never dogmatic, there is a directness and frankness about many of the views expressed which could have been lost in the mass of qualification in a less practical approach.

In fourteen chapters and some 230 pages, including the appendices, the book deals comprehensively with the choice of system, housing and equipment, feeding, breeding, management and the economics of pig keeping. Since food represents over 80 per cent of the cost of fattening, it is fitting that it should receive special attention: both the theory and practice of feeding—including the part played by vitamins, antibiotics and minerals—are dealt with. Special attention is also devoted to management and housing. A sound, economic approach runs right through all sections of the book, and some helpful guidance on how to assess the economic effects of various technical and practical decisions is given in the last chapter.

The book can be recommended with confidence to all practical pig keepers. The logical development of sound, scientific thinking makes it easy to read and understand, and the wealth of information and suggestion which it contains makes it very well worth while.

T.C.C.

Broilers: Production and Management (2nd edition). E. F. GOLDEN. Poultry World. 10*s*. 6*d*.

The broiler industry in the United Kingdom continues to grow so rapidly that inevitably information on production and management methods quickly becomes out of date. Therefore, the revised edition of this book is welcome: it gives an account of the latest practices and developments in marketing, as well as management. All those at present engaged in broiler production will find valuable practical advice packed in its 123 pages; while a study of the book in detail by intending broiler producers, before embarking on actual production, is especially recommended. Not only does it deal with the basic principles of production, but the author also explains the functions of broiler groups and the marketing organization needed to sell the end product in ever-increasing quantities to the British housewife.

Two specialist contributions are included in this edition. In the chapter on "Breeding and Chick Production", Mr. Keith Wilson explains, from first-hand experience, the complexities of the problems involved in developing nucleus breeding stocks, and the multiplication procedures needed to produce, at an economical cost, the even flow of broiler chicks desired by the industry. The supply of suitable broiler chicks has not, perhaps, kept pace with the development on the production side, but breeders and hatcheries have, in recent years, been testing and developing special strains and crosses with the result that the industry is now beginning to reap the reward of their efforts.

Dr. J. L. Williams deals expertly with the subject of nutrition in the chapter headed "Principles of Broiler Nutrition". He gives a concise but excellent account of compounding broiler diets, factors affecting food utilization, calorie/protein ratios, types of feed and feeding programmes. He does not forget to mention the proper nutrition of the broiler parent stock, and the important part it plays in ensuring that the chick gets away to a good start. References for further reading on poultry nutrition are given. While

these will be appreciated by the student and adviser, their usefulness to the practical broiler producer is limited unless he has access to a scientific and technical lending library.

For those of us who, like the author, have had experience of pre-war table poultry marketing, the advances in refrigeration techniques appear very remarkable. They have revolutionized table poultry marketing. Without these modern methods, which are fully described in the last chapter, the pre-packed, eviscerated broiler could not, to quote from the author's introduction, have "changed the pattern of table poultry from something that was a luxury and for special occasions to a regular feature in the national diet".

R.F.H.

East Malling Research Station Annual Report, 1959. 17*s.* 6*d.*

This well-indexed 144-page report caters admirably for readers with different interests. Progress on the experimental fruit farm, nurseries and glasshouses is recorded, and the scientific work of each section is reviewed briefly. The largest part of the report is devoted to longer papers on specific research projects. Finally, there are five bulletins for growers, including an impression of fruit-growing practices in Australia and New Zealand, a review of the apple pruning trials which have now been running at East Malling for fifteen years, and useful summaries of items of practical interest concerning research in hop disease, and in fruit crops.

A nematode, *Xiphinema diversicaudatum*, has been identified as the vector for the soil-borne virus arabis mosaic that affects strawberries, but the carrier for nettlehead virus of hops still eludes detection. The range of varieties in which virus-free material is available for propagation has been extended, and nine more varieties of plums, three of cherry, one of apple and one of pear have been added to the Mother Tree Scheme for distribution as virus-tested scions.

Trials with filler trees on exposed hill-top orchards showed that they increased cropping of the permanent trees by as much as 67 per cent at thirteen years old. The most effective arrangement is to plant one central filler, preferably on M.IX rootstock, in the middle of the squares formed by four trees. In experiments on apple canker control, two autumn copper sprays greatly reduced the incidence of new cankers. At least one further spray in spring is advisable, especially in wetter areas.

Against fire blight, the varieties Williams' Bon Chrétien and Conference have proved to be more resistant than Laxton's Superb pears, and Cox's is more resistant than certain North American apples; the ornamental shrubs *Chaenomeles, Cotoneaster, Pyracantha* and *Sorbus* are susceptible. Using phage-typing, the fire blight bacterium can now be identified, and also distinguished from blossom wilt, within twenty-four hours.

Copies of the report may be obtained from the Secretary, East Malling Research Station, East Malling, Maidstone, Kent.

S.L.

The Reluctant Farmer. MARGARET MACDIARMED. Arthur Barker. 12*s.* 6*d.*

Ardsonach, in Argyll, is the setting for this most recent production in the "I came, I farmed, I departed" series of books, for which the west Highlands, and Argyll in particular, are becoming renowned—or notorious.

Having displaced tenant Hughie Ross, "a wicked if likeable old reprobate, who had eked out a satisfactory enough existence on farm subsidies", the author and her husband proceeded to farm and keep open house for their many friends from the south. It is interesting to reflect that the Hughie Rosses of Argyll are continuing to eke out an existence, despite interruptions, though their personalities may be slightly clogged by the author's metaphorical "West Highland Moss".

Although the tragic death of the author's husband after a few months at Ardsonach precluded the possibility of any aspect of real farming in the remaining half year of occupancy, the courage displayed by Margaret MacDiarmed in dealing with completely novel problems certainly commands admiration.

The first sheep-gathering day, the first market and the author's first battle with her entire labour force—Jimmy Sinclair, whose variety and choice of epithets is masterly—form some of the many pen-pictures so very well portrayed, while throughout the pages the author's effervescent sense of humour invariably bubbles over to smooth her way.

Some of the people in the book appear a little unreal. The "number of neat officials in neat new cars with neat black brief cases" bear no resemblance to the tweedy types who range over Argyll on Department of Agriculture business, distributing largesse in the form of subsidies to a receptive farming community.

The description of the beautiful land of North Argyll and the portrayal of the local way of life should attract tourists, photographers and fishermen, but the farming aspect of the story will cause aspiring reluctant farmers to remain—reluctant.

A.McL.

Digest of Land and Property Cases, 1958. Edited by PETER ASH. Estates Gazette. 45*s.*

By paying scrupulous regard to the relevance f cases previously decided, the courts sustain the importance of a careful record of earlier decisions to our legal system. For many years the *Estates Gazette's* annual *Digest of Cases* has given to lawyers and surveyors an accurate and clearly written account of cases decided in the courts, or before the Lands Tribunal.

A digest is a valuable guide, and this volume includes some of the cases reported in weekly issues of the *Estates Gazette* during 1958. The compiler frankly says that cases dealing with practical points have been preferred to those of more theoretical import. One case arose from a notice to quit a farm which named the wrong person as landlord; another from a dispute as to the right of a lessee to assign a lease of a restaurant. These are only two examples of the issues which can arise from the complicated mass of real property law.

The 1958 Digest notes nearly 150 cases to do with landlord and tenant matters, rating, compensation, planning, buying and selling property. It is not for the general reader.

R.G.A.L.

Fibreboard Baskets for Tomatoes. British Standard 3200: 1960. British Standards Institution. 3*s.*

One more step has been taken towards standardization within the horticultural industry. The standard will help to cut costs, and facilitate stacking and handling; it has been made compatible with the appropriate British Standard pallets. Purchasers will now be able to order a reliable article simply by reference to the British Standard number.

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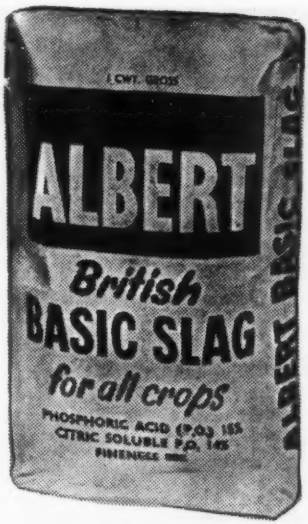

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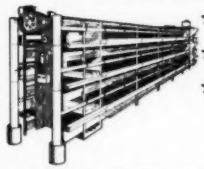

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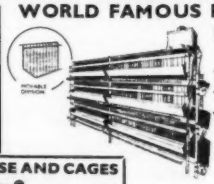

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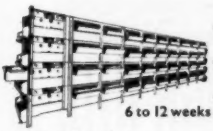

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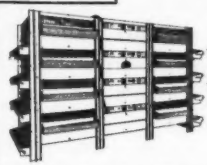

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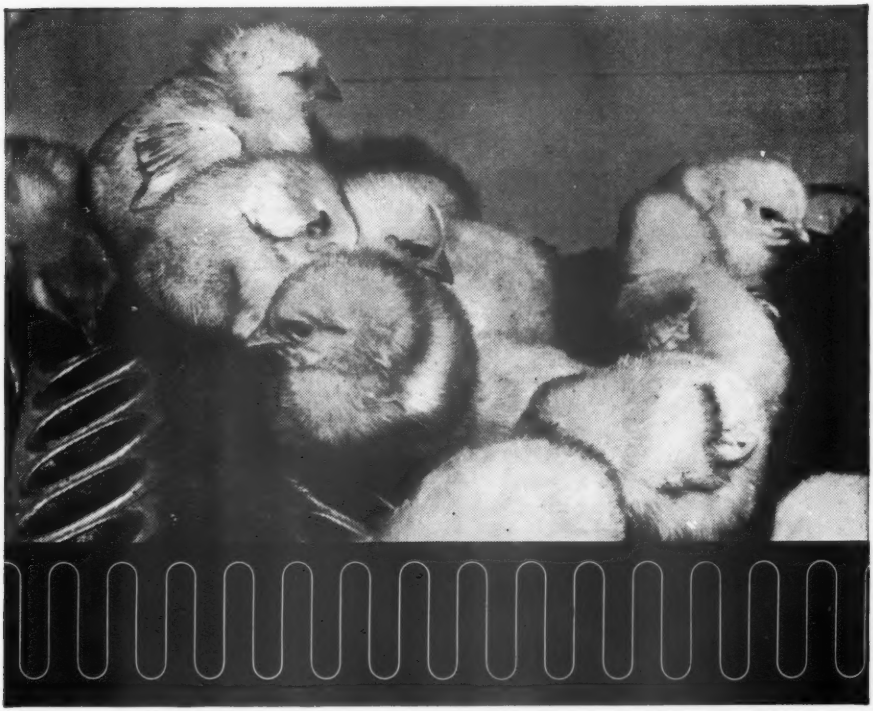

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